TRANSPORTATION

A SUBSTUDY OF THE REGIONAL OFFICIAL PLAN

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TRANSPORTATION IMPACTS OF DEVELOPMENT ALTERNATIVES

THE PLANNING AND DEVELOPMENT DEPARTMENT OF
THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH

OCT.'76

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A Sub Study of the Regional Official Plan

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Report No. 4

TRANSPORTATION IMPACTS

OF

DEVELOPMENT ALTERNATIVES

Planning and Development Department

Regional Municipality of Hamilton-Wentworth

November 1976

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1.0 INTRODUCTION

1.1 Purpose

The purpose of this report is to identify the transportation related impacts associated with each of the seven alternative development patterns being considered in the Regional Official Plan Study. (see Appendix B).

The impacts which are identified herein are the social, environmental, cost and transportation service impacts which will result from the major elements (transit and arterial road facilities) of the transportation systems required to serve the different development patterns. To determine the impacts it was necessary to forecast the year 2001 travel demands and identify the major elements of the transportation system required to accommodate those travel demands. In selecting the major elements of the required transportation system, an estimate was made of the degree to which transit can be expected to accommodate the increased travel demands resulting from future growth. In order to arrive at this estimate, certain assumptions have been made regarding future transit service policies. These assumptions are identified in Section 3.1, "Travel Demand and the Role of Transit".

1.2 Relationship to the Official Plan Study

One of the major tasks of the Official Plan Study is to identify a preferred development pattern for the Region. Seven alternative development patterns have been identified. To assist in the identification of the preferred development pattern, a

comprehensive analysis of the impacts of each of the development alternatives will be undertaken. The types of impacts to be considered are related to: the nature of development, physical environment, social environment, transportation and municipal financing. The transportation system related social, environmental, economic and transportation service impacts identified in this report comprise one segment of a comprehensive impact analysis of the alternative development patterns.

Transportation systems play a major role in the encouragement and achievement of development patterns. The absence of adequate transportation facilities and services will constrain development. Decisions regarding the desirability and feasibility of a particular development pattern cannot be made without an understanding of the kind of transportation system required to achieve the development pattern and the social, environmental, economic and transportation service impacts associated with that required transportation system. These transportation system related impacts also provide a basis for judging the feasibility of implementing the required system. The extent to which the required transportation system can be implemented will have a profound effect on the degree to which the particular development pattern can be achieved. Therefore, although the transportation system related impacts identified in this report comprise only one segment of a comprehensive impact analysis of the alternative development patterns, it is a very important part of the analysis.

1.3 Study Area and Land Use Alternatives

The study area includes the Regional Municipality of Hamilton-Wentworth and the City of Burlington. Burlington was included because of the strong transportation interaction between the cities of Hamilton and Burlington. This interaction can best be accounted for by including Burlington in the transportation model when forecasting internal travel demands. The study area is divided into a number of traffic zones for planning purposes. The study area and the internal traffic zones are shown in Appendix A.

Seven land use development options were prepared and analyzed for potential impacts. The land use alternatives have been labelled: TREND, SOUTH CENTRAL, SOUTH DECENTRAL, C.O.L.U.C., CONGLOMERATE, EASTERN AND WESTERN. A projection of land use variables (population and employment) by traffic zone was prepared for each of the land use alternatives for analysis by the travel forecast model. The land use variables by planning division (aggragated traffic zones) are shown in Appendix B. Land use in the City of Burlington remains constant under all the alternatives and represents the Region of Halton's TREND development option. This reflects a a medium growth rate for the City of Burlington.

2.0 SUMMARY AND CONCLUSIONS

The alternative land use development options have been analyzed with respect to the transportation system improvements necessary for their support and the relative impacts of these transportation improvements. Transportation needs were established for each of the land use development options by projecting travel demands with the aid of a travel forecast model. "Representative" transportation system improvements were developed that were capable of providing sufficient transportation capacity to meet the projected travel demand associated with each of the land use development options. Transportation impact measures were developed for each of the representive transportation system improvements and were summarized for each of the land use development options. The impact measures include community and environmental disruptions, capital costs for major transportation improvements, relative transit operating deficits, relative potential for the use of public transit and a relative measure of overall accessibility.

2.1 Assumptions

The transportation system improvements and the related transportation impacts were developed under assumptions concerning the type of improvements, increases in the future role of transit and the minimum level of service for which road improvements are required. The transportation improvements considered in this report are representative of the type of solutions required to adequately meet the transportation deficiencies and adequately serve the alternative land use options. The specific location (but not the mode) of these "representive" transportation system improvements

may change as a result of more detailed secondary planning studies (route location studies) to be conducted following the completion of the Regional Official Plan. However these "representative" transportation system improvements do provide a basis for consistent and reasonable estimates of the transportation related impacts of the alternative development patterns.

The role of public transit is considered to increase substatially for all the land use development options. This increased transit usage is dependent on the following conditions being met under all land use development options:

a. Good transit coverage and service throughout the whole of the future urban area,
b. Transit connections from all parts of the urban area to the downtown Hamilton area capable of competing with the private auto,
c. Good commuter transit service between the cities of Hamilton and Burlington, complemented by good local transit feeder systems in both cities,
d. Special provisions for transit (such as priority operations) in all congested transportation corridors,
e. Separate R.O.W. transit in all corridors where demands warrant,
f. Improved transit circulation system in the downtown area, and
g. Parking policies for the downtown Hamilton area that encourage the use of public transit,
h. Transit connections beyond the study area are not considered since these would be the same for all options.

The representative road system improvements and the related transportation impacts were developed under the following assumptions:

a. Improvements were limited to those expansions required to provide sufficient capacity to satisfy the projected peak hour travel demands at the minimum level of service (level of service E in urban areas and level of service D in rural areas).

b. Possible highway connections between the Hamilton-Wentworth - Burlington area and points beyond, as well as highway bypasses of the urban area were not included in the analysis since these possible improvements would be similar for all alternatives.

2.2 Transportation Deficiencies

The projected peak hour travel demands associated with each of the alternative land use development options are summarized in figures 3-1 and 3-2. These figures show the forecasted peak hour travel demands (in the peak direction) for twenty-six (26) major transportation corridors. The travel demand data associated with each of the seven land use development alternatives are shown along with the existing capacities for each of the transportation corridors.

Significant transportation system deficiencies will occur, under all the alternative land use options, in the following corridors:

a. The Hwy. 403 Hamilton-Burlington Corridor (S.L. 8)

b. The Q.E.W. Skyway - Beach Boulevard Corridor (S.L. 24)

c. The West Downtown Hamilton Corridor (S.L. 18)

The analysis also indicates that the following corridors will have significant transportation deficiencies for some but not all land use development options:

a. The East Downtown Hamilton Corridor (S.L. 19)

b. The East Hamilton - Stoney Creek Escarpment Corridor (S.L. 16 and S.L. 17).

c. The Flamborough Escarpment Corridor (S.L. 7 and S.L. 9)

The analysis of the projected net corridor transportation deficiencies show very little difference in the requirements for transportation improvements between the TREND, SOUTH CENTRAL, SOUTH DECENTRAL, C.O.L.U.C. and CONGLOMERATE land use development options. The transportation deficiencies in these alternatives vary only in the East Hamilton - Stoney Creek Escarpment Corridor (S.L. 16) where those land use options with the more dispersed development (TREND, SOUTH CENTRAL AND CONGLOMERATE) have a slightly higher transportation capacity deficiency than the more centralized land use alternatives (SOUTH CENTRAL and C.O.L.U.C.). Table 2-1 summarizes the transportation corridor capacity deficiencies for each of the land use alternatives. The development alternatives fall into three different groups in terms of transportation capacity deficiencies.

2.3 Transportation System Improvements

Three distinct transportation systems were developed for the seven land use development alternatives. Because of the

TABLE 2-1

FUTURE CAPACITY DEFICIENCIES

(YEAR 2001)

LAND USE / CORRIDOR	*NET CAPACITY DEFICIENCY/1000		
	TREND, COLUC, S.CENT./DECENT., CONGLOMERATE	EASTERN	WESTERN
West Downtown Hamilton (SL 18)	6.3 - 7.3	6.6	10.5
West Hamilton Escarpment (SL 15)	1.4 - 1.7	nil	nil
East Hamilton-Stoney Creek Escarpment (SL 16)	3.0 - 5.2 (1)	5.0	2.7
East Downtown Hamilton (SL 20, 26)	3.4 - 3.9	5.3	3.0
Saltfleet Com.-Ham. Mountain (SL 14)	1.4 - 2.0	1.9	0.6
Stoney Creek N-S (SL 23)	0.0 - 0.5	2.9	nil
Flamborough Escarpment (SL 7, 9)	0.0 - 0.8	nil	7.1
Hwy 403, Ham.-Burl. (SL 8)	7.0 - 7.8	7.3	7.5 - 12.7 (2)
Skyway, Beach Blvd. (SL 24)	5.0 - 5.2	5.2	5.7

* expressed in peak hour, peak direction person trips

(1) S. CENTRAL is lowest and CONGLOMERATE highest

(2) range indicates extent to which traffic could be diverted to a more direct route through Dundas to the Greensville area.

similarities in the projected transportation deficiencies, the same transportation system could serve the TREND, C.O.L.U.C., SOUTH CENTRAL, SOUTH DECENTRAL and CONGLOMERATE alternatives, Two separate transportation systems were developed for the Eastern and Western alternatives. The different transportation system improvements are shown in figures 4-1, 4-2, and 4-3.

Table 2-2 summarizes the transportation improvements required for the different land use development alternatives. The table gives a brief description of the improvements and indicates under which land use development alternatives they are required.

All land use development options require certain "common" transportation improvements. These include:

a. Major improvements in the two corridors between Hamilton and Burlington, i.e., a separate right-of-way bus transit facility and road improvements between downtown Hamilton and Burlington via the Highway 403 corridor, and road improvements in the Q.E.W. (Skyway) Corridor.

b. A separate right-of-way transit connection between downtown Hamilton and the Hamilton mountain.

c. An additional east-west road connection joining downtown Hamilton to west Hamilton and Dundas.

d. Improvements to the east-west road connections joining downtown Hamilton to Hamilton east and Stoney Creek.

e. An east-west by-pass of Waterdown.

f. Improved transit service throughout the urban area.

TABLE 2-2

REPRESENTATIVE TRANSPORTATION SYSTEM IMPROVEMENTS

CORRIDOR	ROUTE	DESCRIPTION						LAND USE REQUIRED FOR						
		FROM	TO	WIDTH (LANES)	LENGTH (MILES)	INCREASED CAPACITY (PHPDPT)	COST ($ MILLION)	TREND	SOUTH CENTRAL	SOUTH DECENTRAL	C.O.L.U.C.	EASTERN	WESTERN	CONGLOMERATE
Flamborough Escarpment Corridor	Hwy #6	Hwy #403	Hwy #5	5	2.0	700	5.	●	●	●	●	●		●
	Hwy #6	Hwy #403	Hwy #5	7	2.0	2500	7.						●	
	York - Chapel	Hwy #5	Cootes Dr.	4	4.2	2000							●	
	Hwy #8	Bullocks Corners	Head St. Dundas	5	1.	2000	20.0						●	
	Sydenham Rd.	Alma St.	King St.	-	-	800	1.						●	
Hwy #403 Hamilton-Burlington Corridor	Hwy #403	King St.	Q.E.W.	8	8.	2000	40.0	●	●	●	●	●	●	●
	Perimeter Rd.	Burlington St.	Hwy #6	4	3.7	2500	21.0	●	●	●	●	●		●
	Perimeter Rd.	Burlington St.	Hwy #6	6	3.7	4500	26.0						●	
West Downtown Hamilton Corridor	Aberdeen Ext.	Aberdeen Ave.	Cootes Dr.	4	1.2	1000	4.0	●	●	●	●	●	●	●
	Aberdeen Ave.	Longwood Dr.	Queen St.	6	1	1000	2 0	●	●	●	●	●	●	●
	Cootes Paradise Route	Cootes Dr.	Perimeter Rd.	4	2.4	2000	5.0						●	
	Cootes Dr.	Thorpe St.	Boundary of Dundas & Hamilton	6	1	1500	2.0						●	
	Dundas Bypass (Hatt St.)	Napier St.	Cootes Dr.	4	1	2000	4.5						●	
	Hamilton West Transit R.O.W.	Downtown Hamilton	Hwy #403	NA	1.6	NA	50.0						●	

TABLE 2-2 CONT'D

REPRESENTATIVE TRANSPORTATION SYSTEM IMPROVEMENTS

CORRIDOR	ROUTE	DESCRIPTION						LAND USE REQUIRED FOR						
		FROM	TO	WIDTH LANES	LENGTH (MILES)	INCREASED CAPACITY (PHPDPT)	COST ($ MILLION)	TREND	SOUTH CENTRAL	SOUTH DECENTRAL	C.O.L.U.C.	EASTERN	WESTERN	CONGLOMERATE
Stoney Creek Escarpment	Becketts Dr.	Fennell Ave.	Charlton Ave.	4	1.25	1100	15.0	●	●	●	●			●
	Jolley Cut	Lower Approaches		NA	NA	900	0.5	●	●	●	●	●		●
	Upper James (Claremont)	Mtn. Brow	Limeridge Rd.	6	2.0	1200	5.0	●	●	●	●	●		●
	Parkdale Ave. Extension	Mud St.	Parkdale Ave.	4	2.25	1500	8.5						●	
	Parkdale Ave. Ext to Woodward	Mud St.	Woodward Ave.	4	3.4	2500	8.5	●	●	●	●	●		●
	Hamilton Mtn. Transit ROW	Downtown Hamilton	Mohawk Road	NA	2.1	NA	40.0	●	●	●	●	●	●	●
Hamilton - Corridor	Mountain Arterial	Hwy #403	Hamilton's East Boundary	4	7.4	2700	30.0	●	●	●	●	●		●
	Mud St.	City Boundary	Hwy #20	4	2.75	1000	3.0	●	●	●	●	●		●
	Stone Church Connection	Pritchard St.	Paramount Dr.	4	0.6	1000	0.25	●	●	●	●	●	●	●
East Downtown Hamilton Corridor	Lawrence Ave.	John St.	Kennilworth	4	3.0	1000	10.5	●	●	●	●	●	●	●
	Burlington St.	Parkdale Ave.	Q.E.W.	6	0.7	1000	1.0	●	●	●	●	●	●	●
	Brampton St.	Parkdale Ave.	Q.E.W. South Service Rd.	4	0.8	2000	1.5					●		
	Barton St.	Parkdale Ave.	Hwy #20	6	1.5	1500	3.0					●		
	King St.	Lawrence Ave.	Hwy #20	6	1.4	1500	4.0	●	●	●	●	●		●

TABLE 2-2 CONT'D

REPRESENTATIVE TRANSPORTATION SYSTEM IMPROVEMENTS

CORRIDOR	ROUTE	DESCRIPTION						LAND USE REQUIRED FOR						
		FROM	TO	WIDTH (LANES)	LENGTH (MILES)	INCREASED CAPACITY (PHPDPT)	COST ($ MILLION)	TREND	SOUTH CENTRAL	SOUTH DECENTRAL	C.O.L.U.C.	EASTERN	WESTERN	CONGLOMERATE
Flamborough Internal	Hwy #5	Region's Eastern Boundary	Hwy #6	4	4	1500	5.0	●	●	●	●	●	●	●
	Hwy #5	Hwy #6	Hwy #8	4	8	1500	8.0						●	
	Regional Rd. #4	Hwy #5	Hwy #8	4	1.5	1500	2.0						●	
Stoney Creek East West Corridor	Hwy #8	Dewitt Rd.	Fifty Rd.	4	4	1500	5.0					●		
	Barton St.	Grays Rd.	Fifty Rd.	4	4.5	1500	5.0					●		
Stoney Creek North-South Corridor	Fruitland Rd.	Q.E.W.	Hwy #8	4	1	1500	1.5	●	●	●	●	●	●	●
	Fifty Rd.	Q.E.W.	Hwy #8	4	0.75	1500	1.0					●		
Burlington Skyway - Beach Strip Corridor	Q.E.W.	Hwy #20	Guelph Line Burlington	8	9.0	5000	170.	●	●	●	●	●	●	●

The TREND, SOUTH CENTRAL, SOUTH DECENTRAL, C.O.L.U.C., and CONGLOMERATE land use options all require the same basic transportation system improvements in addition to the "common" improvements. These include:

a. Improvements to existing mountain access roads in the Hamilton Escarpment Corridors (S.L.-15 and S.L.-16)

b. The construction of a new north-south road facility crossing the escarpment in the vicinity of the Saltfleet Community Development with direct connections to the Hamilton Bay Front Industrial Area.

c. The construction of a new east-west arterial road on the Hamilton mountain.

The EASTERN land use development option requires the following transportation system improvements in addition to the "common" improvements

a. Improvements to existing mountain access roads in the Hamilton Escarpment Corridor. (S.L. - 15)

b. The construction of a north-south mountain access road facility in the vicinity of the Saltfleet Community Development with direct connections to the Hamilton Bay Front Industrial Area.

c. Additional improvements to east-west roads joining Hamilton and Stoney Creek.

d. Improvements to the east-west and north-south arterial road network in lower Stoney Creek.

e. The construction of a new east-west arterial road on the Hamilton mountain.

The WESTERN land use development option requires the following transportation system improvements in addition to the "common" improvements:

a. Improvements to all mountain access routes into Flamborough.

b. Construction of a Highway 8 bypass route of downtown Dundas.

c. A direct connection between Cootes Drive and the Industrial Perimeter Road

d. The construction of a six lane rather than a four lane Perimeter Industrial Road between Burlington Street and Highway 6.

e. The provision of a separate right-of-way transit facility in the West Downtown Hamilton Corridor.

f. The construction of a north-south mountain access road facility in the vicinity of the Saltfleet Community Development joining Parkdale Avenue to Mud Street.

2.4 Transportation Related Impacts

The impacts of the alternative land use development options related to transportation and the required transportation system improvements were measured in terms of capital and operating costs, the potential distruption to developed areas and environmentally sensitive areas, and relative measures of accessibility and potential transit usage. Table 2-3 is a summary of the transportation related impact measures for the alternative land use options. The required transportation system improvements are the same for the TREND, SOUTH CENTRAL, SOUTH DECENTRAL,

TABLE 2-3

TRANSPORTATION RELATED IMPACTS OF ALTERNATIVE LAND USE DEVELOPMENT OPTIONS

LAND USE ALTERNATIVE	CAPITAL COST* ($MILLION)				YEARLY*+ TRANSIT OPERATING DEFICIT ($ MILLION)	DISRUPTION MEASURES		ACCESSIBILITY INDEX (MINUTES)	TRANSIT USAGE (PERCENT) MODAL SPLIT
	ROAD		TRANSIT+	TOTAL		COMMUNITY	ENVIRONMENT		
	PROV.	REGION+							
Trend S.Decentral Conglomerate	220	102	40	362	14	16	17	14.4	20.0
S.Central C.O.L.U.C.	220	102	40	362	15	16	17	14.3	20.1
Eastern	225	107	40	372	14	19	17	14.4	19.7
Western	250	81	90	421	16	22	26	14.5	20.0

* 1975 Dollars

+ Before Provincial Subsidy

C.O.L.U.C. and CONGLOMERATE. Of these,the transportation impacts are slightly different for the SOUTH CENTRAL and C.O.L.U.C. because these alternatives are more centralized and are forecasted to have a slightly higher potential for transit.

2.4.1 Capital Costs

The capital costs are total costs for major road and transit improvements to the year 2001. The road costs include improvements to provincial highway and other major road facilities before provincial subsidy. The transit capital costs are total costs before provincial subsidy. Only expenditures required for systems improvements that expand the vehicle capacity of the major roads system or significantly increase the passenger carrying capacity of transit are included. The capital expenditures for road improvements does not vary significantly between the alternative land use development plans. The variation in costs between the alternatives is less than three percent (3%). Capital expenditures for major improvements to the transit operation are required for all the development alternatives. The capital costs for transit are the same for all the alternatives except the WESTERN which requires expenditures in excess of twice the amount for the other development alternatives.

2.4.2 Operating Costs

The operating costs include only the estimated yearly operating deficit (before subsidy) of the urban transit system. The difference in the operating cost of the road system was judged to be insignificant between the land use alternatives and was

therefore not included. The total yearly operating deficit for transit operations varies less than 14 percent between the alternatives. The highest deficit would occur under the WESTERN alternative because this alternative requires more bus miles of operation to provide the required level of transit service. The SOUTH CENTRAL and the C.O.L.U.C. alternatives are estimated to have a slightly higher transit operating deficit than the other alternatives because of a higher projected transit ridership.

The transportation related capital and operating costs (before Provincial subsidies) have been summarized as a yearly per capita cost for input into a financial feasibility analysis of the alternative land use development options. These Regional per capita costs for road and transit are summarized in table 2-4. The costs include only those that are assumed to be Regional responsibilities in the year 2001.

TABLE 2-4

YEARLY TRANSPORTATION RELATED COSTS PER CAPITA

LAND USE	YEARLY COSTS/CAPITA FOR REGIONAL ROADS		YEARLY COSTS/CAPITA FOR REGIONAL TRANSIT	
	1986	2001	1986	2001
Trend	14.64	18.50	22.20	28.17
South Central	14.64	18.50	22.93	29.63
South Decentral	14.64	18.50	22.37	28.51
C.O.L.U.C.	14.64	18.50	22.70	29.17
Conglomerate	14.64	18.50	21.63	27.02
Eastern	14.16	18.07	21.89	27.56
Western	12.47*	14.87*	26.87	34.14

* Lower per capita costs resulting from a higher portion of improvements on Provincial Roads.

\+ Costs before Provincial subsidy.

2.4.3 Community Disruption

The Community Disruption Measure is a representative measure of the amount of disruption to existing residential development which can be expected from the construction of new transportation facilities. The unit of measure is lane miles. Separate R.O.W. transit (I.C.T.) is assumed to be equivalent to 2 lanes of roadway for the purpose of measuring disruption. Since this measure is directly related to the required transportation system improvements, the TREND, SOUTH DECENTRAL, C.O.L.U.C. and CONGLOMERATE land use alternatives have the same amount of community disruption. These alternatives have the lowest measure of community disruption with both the EASTERN and WESTERN having a 20 percent higher measure. The WESTERN alternative has the highest measure of community disruption. The residential areas disrupted under each of the alternatives are listed in table no. 2-5.

2.4.4 Environmental Disruption

The environmental disruption measure is a representative measure of the required additional lane miles of transportation facilities that will affect areas defined as environmentally sensitive[1]. This measure is directly related to the transportation system improvements. The environmental disruption is the same for all land use development alternatives except for the WESTERN alternative where the environmental disruption caused by the required transportation improvements is approximately 50 percent higher than the other alternatives. Table no. 2-5 lists the

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1 Environmentally sensitive areas as defined in Hamilton-Wentworth Region Environmentally Sensitive Areas Study - Ecologistics Ltd. (July 1975)

TABLE 2-5

AREAS IMPACTED BY TRANSPORTATION IMPROVEMENTS

LAND USE OPTION	TRANSPORTATION IMPACTS	
	ENVIRONMENTALLY SENSITIVE AREAS IMPACTED	RESIDENTIAL AREAS IMPACTED
TREND S. CENTRAL S. DECENTRAL CONGLOMERATE C.O.L.U.C.	1. Flamborough Escarpment Face 2. Hamilton Harbour 3. Botanical Gardens 4. Red Hill Creek and Van Wagners Marshes 5. Red Hill Creek Valley 6. Hamilton Escarpment Face	1. Hamilton North End 2. Hamilton West 3. Central Hamilton Mountain 4. Central Hamilton
EASTERN	1. Flamborough Escarpment 2. Hamilton Harbour 3. Botanical Gardens 4. Red Hill Creek and Van Wagners Marshes 5. Red Hill Creek Valley	1. Hamilton North End 2. Hamilton West 3. Central Hamilton Mountain 4. Central Hamilton 5. East Hamilton 6. Stoney Creek
WESTERN	1. Flamborough Escarpment 2. Hamilton Harbour 3. Botanical Gardens 4. Red Hill Creek and Van Wagners Marshes 5. Spencers Gorge 6. Boers Falls - Rock Chapel 7. Cootes Paradise	1. Greensville 2. Dundas 3. Hamilton West 4. Hamilton North End 5. Central Hamilton

environmentally sensitive areas that would be affected by transportation improvements under each of the land use development alternatives.

2.4.5 Accessibility

The relative accessibility indexes are measured by the simulated mean trip lengths for the alternative land use plans. Examination of the simulated mean trip lengths for the alternatives shows that there is no significant difference in accessibility between the land use options. The measure varied by less than two percent among the alternatives.

2.4.6 Transit Usage

The overall peak hour modal split (trips utilizing transit as a percent of all trips occurring) was used as a measure of the potential for transit use under the alternative land use options. No significant difference was found between the alternatives with respect to their relative potential to encourage transit usage. The variation in this measure was less than 2 percent between the various land use alternatives. However, when the efficiency of transit service (operating cost per passenger carried) is taken into account the WESTERN alternative was found to provide the least efficient transit service. This is because of the greater average transit trip length and the resulting higher transit operating costs for the WESTERN alternative.

2.5 Conclusions

A number of impact measures were utilized to assess the transportation related impacts of the alternative land use development options. The measures include: capital cost of transportation improvements, yearly operating deficit of the urban transit system, disruption to existing residential development, disruption to environmentally sensitive areas, relative use of transit service and relative accessibility. The impact measures are summarized by land use alternative in Table 2-3.

Accessibility and transit useage measures showed no significant variation between any of the land use alternatives. Total capital costs were highest for the WESTERN alternative with no significant difference between the other alternatives. Transit operating deficits were highest for the WESTERN alternative with the two centralized plans (S. CENTRAL and C.O.L.U.C.) being the next highest and all other alternatives being similar. The community disruption measure was highest for the WESTERN with the EASTERN being next highest and all other alternatives showing no variation. The environmental disruption measure showed the WESTERN alternative to have a significantly higher impact than the other alternatives which showed no variation among themselves.

Table 2-6 shows the ranking of the alternatives relative to each of the transportation related goals. The land use alternative with the highest ranking value, best achieves the goal. This shows that there is no significant difference in the TREND, S. CENTRAL, S. DECENTRAL, C.O.L.U.C. and CONGLOMERATE alternatives.

TABLE 2.6

RANKING[1] OF ALTERNATIVES

RELATIVE TO TRANSPORTATION RELATED GOALS

LAND USE ALTERNATIVE	MINIMIZE TRANSPORTATION CAPITAL COST	MINIMIZE TRANSIT OPERATING COST	MINIMIZE COMMUNITY DISRUPTION DUE TO NEW TRANSPORTATION FACILITIES	MINIMIZE ENVIRONMENTAL DISRUPTION DUE TO NEW TRANSPORTATION FACILITIES	MINIMIZE TRAVEL TO PLACES OF WORK AND SHOPPING	ENCOURAGE GREATER USE OF PUBLIC TRANSIT	ENCOURAGE EFFICIENT USE OF PUBLIC TRANSIT
Trend	2	2	3	2	NO SIGNIFICANT DIFFERENCE	NO SIGNIFICANT DIFFERENCE	2
S.Central	2	2	3	2			2
S.Decentral	2	2	3	2			2
C.O.L.U.C.	2	2	3	2			2
Conglomerate	2	2	3	2			2
Eastern	2	2	2	2			2
Western	1	1	1	1			1

NOTES: 1. The highest ranking value best achieves the goal.

The EASTERN alternative is ranked lower for one goal achievement measure and the WESTERN is ranked lowest in four of the goal achievement measures.

3.0 TRAVEL DEMAND AND TRANSPORTATION CAPACITY DEFICIENCIES

3.1 Corridor Travel Demands versus Existing Capacities

The P.M. peak hour, person trip, travel demands were simulated for each of the seven land use alternatives for the year 2001. These future travel desires were then aggregated on a corridor basis so that it was possible to summarize and compare the total forecasted interaction in various key areas; e.g., (across Niagara escarpment, Skyway isthmus, etc.). Twenty-six (26) corridors or screenlines were selected for analysis purposes and each was numbered for easy reference. For example, screenline 18 (SL-18) represents the West Downtown Hamilton Corridor which intersects all east-west travel below the escarpment destined for Hamilton's CBD via the West End. A complete description of all the screenlines can be found in Appendix C.

Total travel in any corridor consists of two types of trips, internal and external trips. An internal trip, by definition, must start and end within the Study Area (Hamilton-Wentworth Region and the City of Burlington). External trips, which start and/or end outside of the Study Area, are less sensitive to changes in development patterns within the Region and thus are forecasted to be common to all land use options (for a given horizon year).

Figures 3-1 and 3-2 show the future forecasted corridor travel demands (in the peak direction) for each land use alternative plotted against the capacities[1] of the existing transportation

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[1] Existing capacity - includes allowances for a widened York St. (6 lanes) as well as base year (1971) levels of transit ridership and commercial vehicles.

system (the numerical capacity/demand data can be found in Appendix D). This demand-capacity comparison identifies the transportation corridors which will require improved transportation facilities in order to provide the capacity necessary to accommodate any of the land use alternatives. A brief description of the nature and magnitude of travel demands in those corridors with projected capacity deficiencies follows:

a. West Downtown Hamilton Corridor (SL-18)

Total travel demands are relatively consistent across all land use options (approx. 23,000 pk. hr. pk. dir. person trips) except for the WESTERN alternative which results in significantly higher volumes (approx. 6,000 pk. hr. pk. dir. person trips greater) due to the large population increase in Flamborough.

Internal trips are heavily concentrated at one end in Hamilton's C.B.D. (approx. 55%) while at the other end are split primarily between the City of Burlington, West Hamilton-Dundas and in the case of the WESTERN alternative, Flamborough. Travel in this corridor is largely related to substantial increases in the amount of high order employment forecasted for downtown Hamilton.

External travel, amounting to approximately 5,000 peak hour, peak direction, person trips (PHPDPT), accounts for about 20% of the total demand.

b. West Hamilton Escarpment Corridor (SL-15)

Total travel demand is similar in magnitude for TREND, C.O.L.U.C., CONGLOMERATE, S. CENTRAL and the S. DECENTRALIZED

concepts (approx. 19,000 PHPDPT), while the EASTERN and WESTERN concepts exhibit similar decreases in demand levels of approximately 3,500 PHPDPT due to their extreme (east and west respectively) location of population/employment growth.

Again, internal travel is oriented strongly towards Hamilton's C.B.D. at one end (approx. 55%) with the other trip ends spread across the central and western portion of the Hamilton mountain (Upper Gage Ave. to west Hamilton city limits).

The 3,400 external trips forecasted for this corridor represent about 20% of the total demand.

c. East Hamilton-Stoney Creek Escarpment Corridor (SL-16)

Travel demands in this corridor are highest for the EASTERN and CONGLOMERATE alternatives (approx. 16,000 PHPDPT) due to the projected growth of the Saltfleet and/or Binbrook communities, and lowest (a decrease of 3,000 PHPDPT) in the WESTERN concept. The other alternatives fall somewhere between these extremes.

Internal trip ends below the escarpment are more evenly spread between Hamilton's C.B.D., the Bayfront Industrial Area, Stoney Creek's existing municipal centre and points east. Above the escarpment, trip ends are also dispersed, extending from the central portion of the Hamilton Mountain to the Saltfleet community

External travel is forecasted to be insignificant in this corridor.

d. East Downtown Hamilton Corridor (SL-20, SL-26)

Total travel demands in this corridor are almost identical (approx. 17,500 PHPDPT) for the TREND, C.O.L.U.C., CONGLOMERATE, S. CENTRAL AND S. DECENTRALIZED land use concepts with the WESTERN alternative being marginally lower and the EASTERN alternatives being higher (greater by 2,000 PHPDPT).

North of the C.N.R. rail line almost half of the internal travel is oriented between the Bayfront Industrial Area and the City of Burlington, however, the travel is much more widely dispersed in the portion of this corridor south of the C.N.R. rail line.

The forecasted external travel accounts for 10-15% of the total demand in this corridor. It is primarily oriented towards the Bayfront Industrial Area at the Hamilton end.

e. Saltfleet Community-Hamilton Mountain Corridor (SL-14)

The total travel demands in this corridor range from a high of 5,500 PHPDPT (for the CONGLOMERATE and EASTERN concepts) to a low of approximately 4,000 PHPDPT (for the WESTERN alternative).

The bulk of the internal travel consists of interaction between the Saltfleet-Binbrook communities on one end and the Hamilton Mountain and the Hamilton C.B.D. on the other.

External travel in this corridor is forecasted to be negligible.

f. Stoney Creek, North-South Corridor (SL-23)

As in the other east end corridors, the total travel demands in this corridor for the five land use concepts of

TREND, C.O.L.U.C., CONGLOMERATE, S. CENTRAL and S. DE-CENTRALIZED are all very similar (approx. 7,000 PHPDPT). The EASTERN concept generates demands in this corridor that are significantly higher (greater by 3,500 PHPDPT) due to the greater growth of development in the east. Although improvements to the transportation system appear necessary for the other alternatives, the existing capacity appears to be sufficient to accommodate any increase in travel in this corridor resulting from the WESTERN alternative.

Internal travel largely consists of interaction between the Bayfront Industrial Area and the City of Burlington at one end and the Town of Stoney Creek on the other.

External travel in this corridor accounts for approximately 10-13% (1,200 PHPDPT) of the total demand.

g. Flamborough Escarpment Corridor (SL-7, SL-9)

Total travel demands for all but the CONGLOMERATE and WESTERN concepts are virtually identical (approx. 6,800 PHPDPT) and present no significant future problems in terms of capacity deficiency. The CONGLOMERATE alternative generates marginally higher demands (plus 1,000 PHPDPT) which may necessitate some future transportation improvements. In the WESTERN alternative, however, residential growth in Flamborough results in travel demands of approximately 16,000 PHPDPT which would make the existing transportation links in this corridor completely inadequate.

Internal trip ends in the corridor are largely centred on the Flamborough growth centre(s) at one end but the other

ends of the trips are more diverse with about one-third (33%) terminating in Hamilton's C.B.D. and the rest spread primarily between Dundas-West Hamilton, the Bayfront Industrial Area and the City of Burlington.

External travel amounts to approximately 1,000 PHPDPT.

h. Hwy 403, Hamilton-Burlington Corridor (SL-8)

All the land use concepts generate similar overall travel demands of approximately 20,000 PHPDPT in this corridor except for the WESTERN alternative which has significantly higher travel demands (greater by 8,000 PHPDPT) due to extensive development in Flamborough. Most of this additional demand (in the WESTERN) could potentially be diverted from this corridor, however, if more direct routes (through Dundas and across the escarpment) were provided to serve travel between Hamilton and the Greensville area.

Regardless of the development option selected, there are serious capacity deficiencies forecasted in this corridor.

Internal travel is strongly oriented towards the City of Burlington (up to 75%) and Flamborough at one end. The other trip ends are tied to Hamilton's C.B.D. (approx. 50%) and the surrounding area in the lower city. The complementary nature of land uses at either end of this corridor (residential/employment) results in up to 40% of internal travel (5,000 PHPDPT) being Hamilton C.B.D. - City of Burlington oriented.

Forecasted external travel is also significant in this corridor, representing up to 30% of the total demand.

i. Burlington Skyway-Beach Strip Corridor (SL-24)

The total travel demand estimates for this corridor are similar for all land use concepts (approx. 12,000 PHPDPT).

Virtually all of the internal travel is destined to the City of Burlington at one end. At the other end, the Bayfront Industrial Area provides a focus for 40-50% of this travel, with the remainder distributed to the East Hamilton-Stoney Creek region.

External travel is forecasted to be quite predominant in this corridor (in excess of 4,000 PHPDPT). This is because the corridor serves as a vital transportation link in the Buffalo-Niagara-Toronto highway system.

3.2 The Role of Transit

In order to determine the extent to which transit can be expected to relieve certain corridor capacity deficiencies, future transit ridership has been forecasted. This forecast is based on the application of estimated future modal splits to the different trip interchanges of the various future land uses. These modal split estimates are based on:

a. relationships between level of transit service, density of development and modal split, and,
b. assumptions regarding future transit service policies within the Region.

The technical relationships mentioned in (a) above are documented in Appendix E.

The major assumptions regarding future transit service within the Region and surrounding area are:

a. At present, a relatively small proportion of trips destined to and/or coming from the rural area are made by transit. This is not expected to change in the future.

b. The frequency of service and route coverage in the future urban area (see Figures 4-1, 4-2 and 4-3) will be such that the difference in travel time for a trip by transit as compared to a trip by private auto will not exceed 25 minutes

c. In certain transportation corridors, especially those which have a high proportion of trips oriented to the Hamilton C.B.D. or have high density land uses, this difference in travel time between transit and auto will be reduced by increasing the frequency of service and/or providing separate rights-of-way for transit.

d. Inter-regional transit service between Hamilton and the City of Burlington will be complemented by good, local transit feeder systems in both cities.

e. Improvements will be made to the transit circulation system within the Hamilton Downtown area to accommodate the forecasted increase in the number of transit vehicles entering and leaving in the peak periods.

f. Parking policies which will encourage increased use of transit will be adopted for the downtown Hamilton area.

Table 3-1 highlights the selective application of the future modal split estimates to those corridors previously identified as requiring transportation improvements. The corridor modal splits (expressed as a percentage of internal travel) are indicative of the extent to which travel in that corridor can be diverted to transit. Base year (1971) data are provided in order to help gauge the magnitude of the forecasted transit use.

3.3 Future Capacity Deficiencies

Year 2001 transportation capacity deficiencies resulting from the adoption of each development concept were estimated by comparing the total forecasted travel demands and the estimated future extent of transit usage (as outlined in Sections 3.1 and 3.2 respectively) to the capacities of the various corridors.

Table 3-2 summarizes these net corridor capacity deficiencies by aggregating the development alternatives (and results) into three relatively homogeneous groups:

a. TREND, C.O.L.U.C., S. CENTRAL, S. DECENTRALIZED, CONGLOMERATE.

b. EASTERN

c. WESTERN

Projected net corridor deficiencies for the first five development concepts (group a) were not judged to be significantly different, except across the East Hamilton-Stoney Creek Escarpment corridor (SL-16) which had higher future deficiencies for those land use concepts (TREND, CONGLOMERATE AND S. DECENTRALIZED) which have a more dispersed type of growth on the escarpment to the south and east of Hamilton.

Table 3-1

FUTURE PEAK HOUR TRANSIT RIDERSHIPS

CORRIDOR	MODAL SPLIT+		TRANSIT RIDERSHIP# /1000	
	Base Yr (1971)	Horizon Yr (2001)	Base Yr (1971)	Horizon Yr (2001)
West Downtown Hamilton (SL 18)	11%	23-28%*	0.9	4.3-6.6*
West Hamilton Escarpment (SL 15)	21%	35-37%*	1.8	4.3-5.9*
East Hamilton - S.C. Escarpment (SL 16)	8%	25-29%*	0.5	3.0-4.2*
East Downtown Hamilton (SL 20, 26)	11%	16-18%	0.9	2.3-3.0
Stoney Creek, N.-S. (SL 23)	-	11-15%	-	0.6-1.4
Skyway, Beach Blvd. (SL 24)	-	13-14%	-	1.0-1.2
Flamborough Escarpment (SL 7, 9)	-	8-21%	-	0.5-3.0
Highway 403, Ham-Burl. (SL 8)	-	18-21%	-	2.5-5.1**

\+ expressed as a % of total internal travel
\# P.M., peak hour, peak direction
* includes consideration of impact of separate R.O.W. transit
** approx. 1.8 of the 5.1 could potentially be diverted from this corridor (through Dundas to Greensville) dependent on the future configuration of the transit system.

TABLE 3-2

FUTURE CAPACITY DEFICIENCIES

(YEAR 2001)

LAND USE / CORRIDOR	*NET CAPACITY DEFICIENCY/1000		
	TREND, COLUC, S.CENT./DECENT., CONGLOMERATE	EASTERN	WESTERN
West Downtown Hamilton (SL 18)	6.3 - 7.3	6.6	10.5
West Hamilton Escarpment (SL 15)	1.4 - 1.7	nil	nil
East Hamilton-Stoney Creek Escarpment (SL 16)	3.0 - 5.2 (1)	5.0	2.7
East Downtown Hamilton (SL 20, 26)	3.4 - 3.9	5.3	3.0
Saltfleet Com.-Ham. Mountain (SL 14)	1.4 - 2.0	1.9	0.6
Stoney Creek N-S (SL 23)	0.0 - 0.5	2.9	nil
Flamborough Escarpment (SL 7, 9)	0.0 - 0.8	nil	7.1
Hwy 403, Ham.-Burl. (SL 8)	7.0 - 7.8	7.3	7.5 - 12.7 (2)
Skyway, Beach Blvd. (SL 24)	5.0 - 5.2	5.2	5.7

* expressed in peak hour, peak direction person trips

(1) S. CENTRAL is lowest and CONGLOMERATE highest

(2) range indicates extent to which traffic could be diverted to a more direct route through Dundas to the Greensville area.

The major assumptions relating to the calculation of the net corridor capacity deficiencies (as shown in Table 3-2) are as follows:

a. Level of service E was assumed for major road facilities when calculating the capacity of all urban corridors;

b. only existing roads (plus a widened York St. - 6 lanes) were included in capacity calculations;

c. allowance was made in the capacity calculations for the future estimated levels of transit usage, and

d. separate right-of-way transit was assumed to exist (by the year 2001) in:

   i a North-South corridor from Hamilton C.B.D. to the central mountain (for all development alternatives) and,

   ii an East-West corridor connecting downtown Hamilton to Hwy 403 (for the WESTERN development concept only).

Examination of Table 3-2 shows that significant transportation system deficiencies (in excess of 5,000 PHPDPT) are forecasted in the following corridors for all of the development alternatives tested:

a. Hwy 403, Hamilton-Burlington Corridor (SL-8)

b. West Downtown Hamilton Corridor (SL-18)

c. Skyway, Beach Blvd. Corridor (SL-24)

It also indicates that the following corridors have significant deficiencies which may vary dependent on the development option tested:

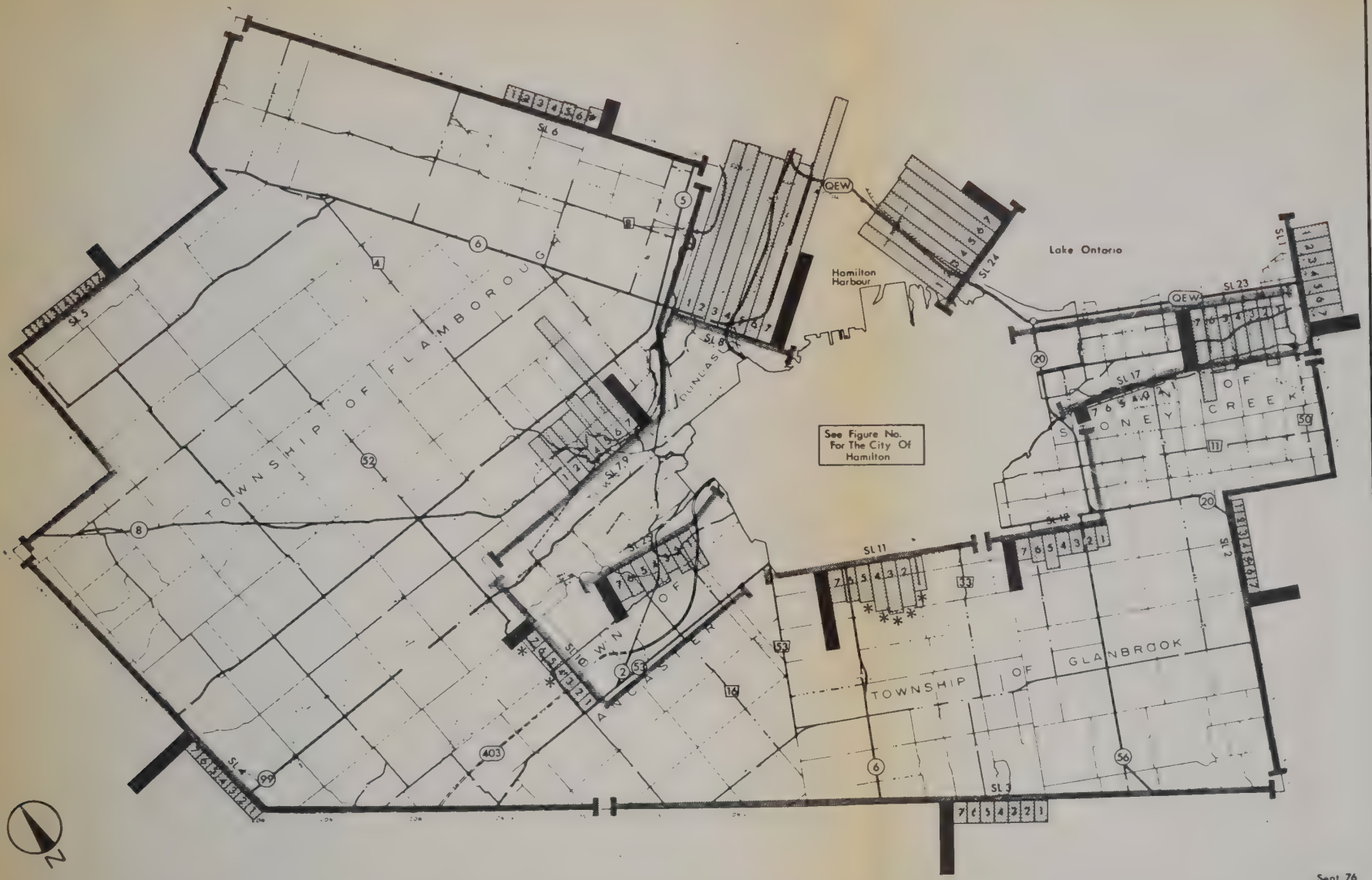
a. East Downtown Hamilton Corridor (SL-19)

b. East Hamilton-Stoney Creek Escarpment Corridor (SL-16, SL-17)

c. Flamborough Escarpment Corridor (SL-7, SL-9)

Since future levels of transit ridership have already been incorporated into the calculation of the net corridor deficiencies, it is assumed that only road oriented solutions could be applied to meet these unsatisfied demands. A complete description of the transportation improvements required to satisfy these future travel demands (thus allowing the related development alternative to occur) is contained in the next chapter.

Figure No. 3·1

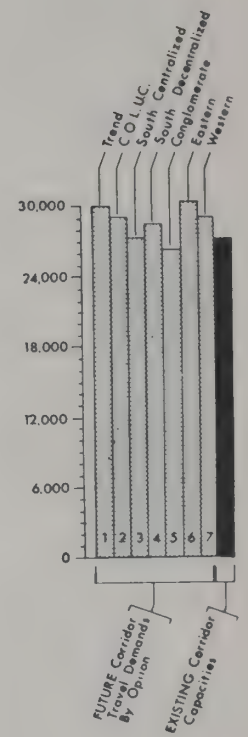


Not To Scale

Sept. 76

LEGEND

YEAR 2001 P.M. PK. HR. PK. DIRECTION PERSON TRIPS (12,000 PER INCH)



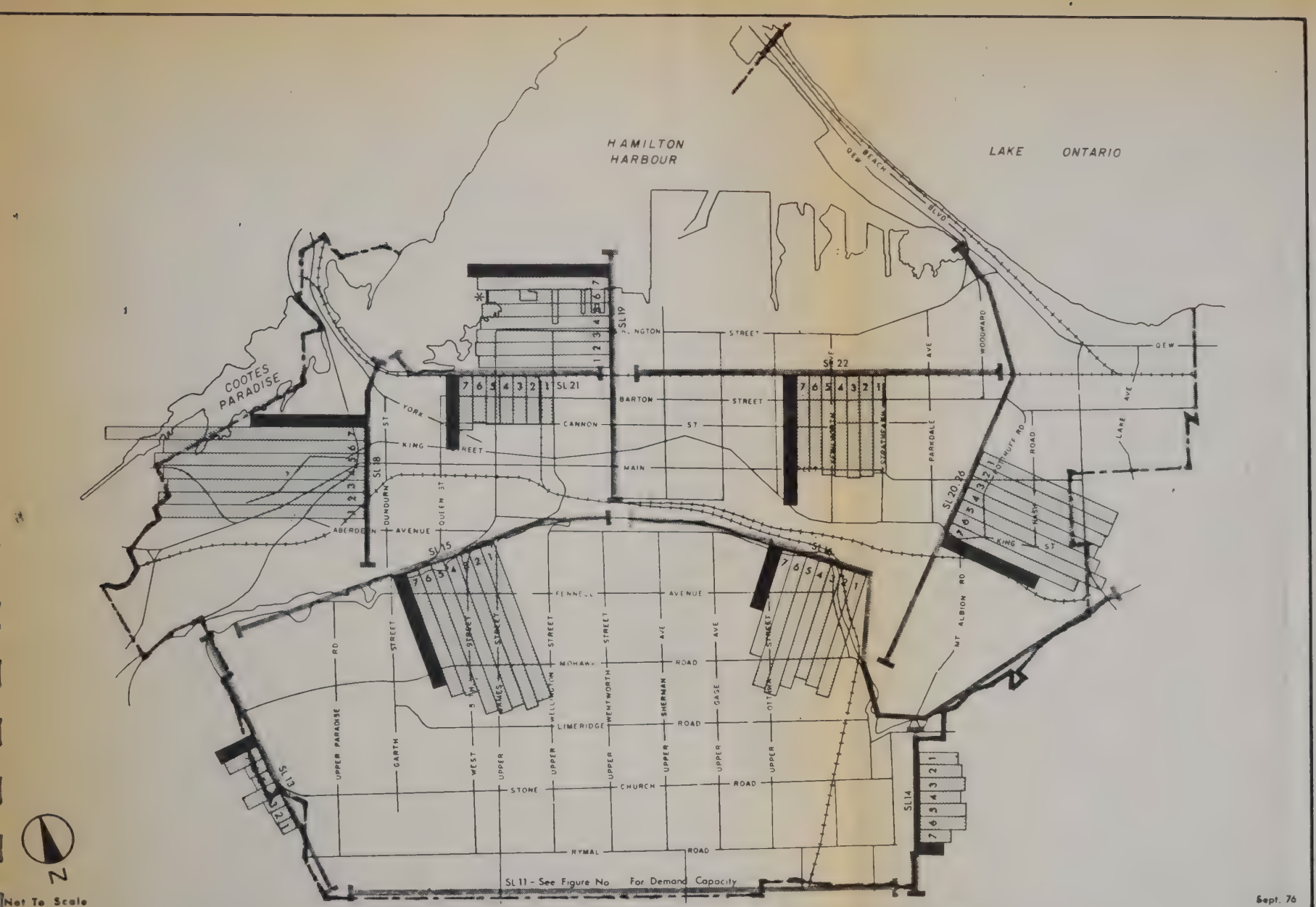
* P.M. Peak Direction for Option Indicated Is Opposite To That Shown

Transportation Impacts of Development Alternatives

2001 CORRIDOR DEMANDS (Outside the City of Hamilton)

Planning & Development Department
Hamilton-Wentworth Region

Figure No. 3-2

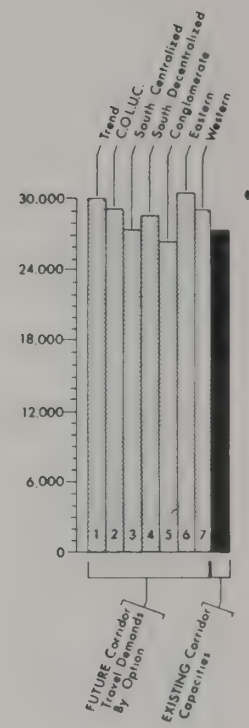


Not To Scale

Sept. 76

LEGEND

YEAR 2001 P.M. PK. HR. PK. DIRECTION PERSON TRIPS (SCALE: 12,000 PER INCH)



* P.M. Peak Direction for Option Indicated Is Opposite To That Shown

Transportation Impacts of Development Alternatives

2001 CORRIDOR DEMANDS (Within the City of Hamilton)

Planning & Development Department
Hamilton - Wentworth Region

4.0 TRANSPORTATION SYSTEM REQUIREMENTS

The transportation system improvements outlined in this section have been developed under the limitations of the following assumptions:

a. Future transit ridership will increase significantly and the supply of surface bus transit will be increased sufficiently to meet the projected demands for transit. Capital intensive transit improvements (exclusive right-of-way transit facilities) will be considered only where the projected peak hour travel demands warrant it.

b. The road system will be improved to provide only the transportation capacity required to satisfy the projected peak hour demands at the minimum level of service (level of service E). This assumption is consistent with current provincial policies. Roads required to complete the basic road system configuration and to provide adequate access to new development areas are also included.

c. Decisions on road system improvements required to provide connections to areas outside the Study Area or to provide a bypass function of the main urban area of the Region, cannot be made at this time due to lack of information. Therefore, these types of facilities are not described in the transportation system improvements or included in the transportation system impacts measures. Since these types of facility requirements should not vary significantly

with the land use development options, their exclusion should have no effect on the relative impact measures between development alternatives. The need for further study of such facilities is designated on the transportation system maps. The information necessary to answer questions concerning the need for these facilities is in the process of being prepared.

The major road and transit improvements, as described in the following sections, provide the minimum transportation capacity required while still providing the level of accessibility necessary to allow for the full achievement of each of the land use development alternatives. The improvements outlined here are not to be considered as recommended solutions for each of the land use alternatives, but rather as representative of the type of solutions required to meet the projected transportation deficiencies associated with the different land use development options. The improvements outlined here were taken from past studies and proposals where these were available. In corridors where deficiencies are projected and where no past proposals existed, a solution judged to provide the least impact was utilized. All transportation impact measures developed in this report are based on the representative improvements in the following sections.

Because of similarities in the transportation requirements in some of the plans, only three distinct transportation system alternatives were developed. These transportation systems are shown in Figures 4-1, 4-2 and 4-3.

4.1 Requirements Common To All Land Use Alternatives

All of the alternative land use development options have some common transportation system requirements (see Figures 4-1, 4-2 and 4-3). The high employment growth forecasted for downtown Hamilton and the substantial residential population increase forecasted for Burlington in all the land use options will result in a strong transportation interaction between the two cities. Extensive transportation improvements will be required in both the Highway 403 and the Q.E.W. Skyway corridors in order to accommodate this interaction. In all the land use alternatives, enough development growth is common to require some similar transportation improvements in: the escarpment corridor between downtown Hamilton and the Hamilton mountain, the corridor between downtown Hamilton and west Hamilton, and the corridor between downtown Hamilton and east Hamilton.

a. The Burlington Skyway - Beach Strip Corridor

Projected transportation deficiencies in the Q.E.W. Skyway corridor are fairly consistent for all the land use alternatives tested and show a need for two additional lanes of roadway in each direction. Improvements in urban transit service across this corridor are also required but because of the large amount of external and through traffic and because of the scattered trip ends in Burlington and the policy of private industry to provide large volumes of employee parking in the Hamilton Bay Front Industrial area, transit cannot be considered as the major solution to transportation deficiencies in this corridor. The Provincial Ministry of Transportation

and Communications has proposed an expansion of the Q.E.W. between Highway 20 and Guelph Line to provide four lanes of roadway in each direction with a separate right-of-way for transit and twin tunnels passing under the ship canal. This improvement would be sufficient to accommodate the transportation demands forecasted in this corridor. Improvements to Burlington Street east of Strathearn Street, with an improved interchange with the Q.E.W. will be required to accommodate the projected increase in traffic into and out of the industrial area.

b. Highway 403 Hamilton - Burlington Corridor

The projected growth in employment opportunities in downtown Hamilton and the resultant interaction with Burlington will require improvements in the Highway 403 Hamilton-Burlington corridor. The travel demands between downtown Hamilton and the City of Burlington are sufficiently large and the potential for transit use is such that a separate right-of-way bus transit service should be considered with a terminus in Hamilton's downtown and good connections to the Burlington transit system. However, transit service alone will not handle all the projected transportation deficiencies. There is enough demand to warrant three additional lanes of roadway in each direction in this corridor.

Additional road capacity could be provided by expanding Highway 403 to eight lanes between Main Street in Hamilton and the Q.E.W. in Burlington with collector-distributor roads in Hamilton and by the construction of the Industrial Perimeter

Road to connect Burlington Street to Highway 6 with an improved interchange between Highway 6, Highway 403 and the Perimeter Road.

Connections to north Burlington could be made via Highway 6 and Highway 5. This will require the expansion of Highway 6 to provide at least an additional climbing lane for trucks and the expansion of Highway 5 to four lanes from Highway 6 east. Development in the former Town of Waterdown necessitates that an improved Highway 5 facility should bypass to the north of the town.

c. West Downtown Hamilton Corridor

All of the land use development alternatives require an additional road connection between downtown Hamilton and the Hamilton west-Dundas area. This could be accomplished by the construction of a new four lane road facility joining Cootes Drive to Aberdeen Avenue. This additional connection would require the expansion of Aberdeen to six lanes west of Queen Street. This improvement would provide sufficient transportation capacity in this corridor for all land use options but the WESTERN alternative, which will require this connection as well as additional road and transit improvements.

d. East Downtown Hamilton Corridor

An additional direct east-west road connection is required immediately below the escarpment in Hamilton to connect the Hamilton downtown area to development areas below the escarpment in Hamilton's east end. This connection could be provided by the previously proposed Charlton Avenue-Lawrence

Road connection with improvements to Lawrence Road between Gage Avenue and Kenilworth Avenue. This should be a four lane facility. Improvements at the junction of Lawrence Road and King Street will be required along with this road improvement.

e. Hamilton Escarpment Corridor

In order to obtain the peak hour transit riderships as forecasted and to divert more trips to transit, thus minimizing the need for additional mountain access routes (particularly in the central and west Hamilton mountain areas), an exclusive right-of-way Intermediate Capacity Transit (I.C.T.) connection between the Hamilton downtown area and the Hamilton mountain is required under all the land use development alternatives. The facility should extend from Hamilton's central downtown southerly as far as Limeridge Road and should be located somewhere between West Fifth Street and Wentworth Avenue.

f. Stoney Creek North South Corridor

Industrial development in Stoney Creek requires additional north south access between the Q.E.W. and Highway 8. Because of the existing locations of interchanges with the Q.E.W. this access could best be provided by expanding Fruitland Road.

4.2 Additional Requirements for the TREND, S. CENTRAL, S. DECETRALIZED, C.O.L.U.C. and CONGLOMERATE LAND USE ALTERNATIVES

The TREND, S. CENTRAL, S. DECENTRALIZED, C.O.L.U.C. and CONGLOMERATE land use alternatives all require the same basic transportation system improvements. The main emphasis on improvements in these alternatives is in the corridors between the Hamilton mountain and lower Hamilton areas (see Figure 4-1).

In addition to the improved transit connection across the escarpment between the Hamilton downtown and the Hamilton mountain, some improvements must be made in the road connections in order to accommodate the projected increase in peak hour travel demands.

a. West Hamilton Escarpment Corridor

Across the western and central escarpment, improvements to the existing mountain access routes could be sufficient to alleviate the projected deficiencies in transportation capacity. Possible road improvements in the corridor include:

i) a widening and reconstruction of Becketts Drive to four lanes between Fennell Avenue and Aberdeen Avenue with a six lane section along Queen Street between Aberdeen and Charlton Avenue. Intersection improvements would be required at the junction of Queen and Aberdeen and the junction of Queen and Charlton;

ii) a widening and reconstruction of the lower approaches to the Jolley Cut and the James Mountain Road. These improvements would be limited to areas south of Charlton Avenue and include the addition of turning lanes and the improvements of roadway geometrics. These improvements would allow for the full utilization of the capacities of the mountain access portions of these routes;

iii) a widening of the upper approaches to the Claremont Access (Upper James Street). Upper James should be widened to six lanes from the mountain brow to Lime-

ridge Road to allow for the utilization of the full capacity of the Claremont Access.

b. East Hamilton - Stoney Creek Escarpment Corridor

In the east, the forecasted mountain access transportation deficiency could be alleviated by the construction of a four lane road facility along the previously proposed Parkdale Avenue Extension route. The original proposal would have to be modified by joining this facility to Woodward Avenue via the Red Hill Creek Valley so as to provide a direct connection to the Bay Front Industrial area.

c. Saltfleet Community and Hamilton Mountain East-West Corridor

In order to connect new development in the Saltfleet Community to the Hamilton mountain area and to provide good access between all development areas and the north-south mountain access routes, a four lane east-west urban arterial roadway could be built in the proposed Mountain Expressway right-of-way. This facility should extend from Highway 403 in the west to an improved Mud Street in the east with access to all major north-south arterial roads.

Mud Street should be reconstructed as a four lane roadway from the Hamilton-Stoney Creek border to Highway 20. This facility will be required to serve the Saltfleet Community and to carry through traffic.

d. Urban Transit Service

Urban transit service should be expanded to provide service to all development on the Hamilton mountain and in the Saltfleet Community Development as well as development

areas in Dundas, Ancaster and lower Stoney Creek. In the S. CENTRAL, S. DECENTRALIZED and the C.O.L.U.C. land use alternatives, the urban transit service should be further expanded to include development areas in northern portions of Glanbrook.

4.3 Additional Requirements for the EASTERN Land Use Alternative

The EASTERN land use development alternative requires additional road improvements to provide access across the escarpment corridors in Hamilton and Stoney Creek and to provide east-west access between Hamilton and Stoney Creek as well as improvements for circulation within Stoney Creek (See Figure 4-2).

a. West Hamilton Escarpment Corridor

Projected mountain access deficiencies across the west and central escarpment can be accommodated by improvements to existing mountain access routes. The required improvements would include:

i) a widening and reconstruction of the lower approaches to the Jolley Cut and James Mountain Road. These improvements would be south of Charlton Avenue and include the addition of turning lanes and the improvements of roadway geometrics;

ii) a widening of the upper approaches to the Claremont Access. This requires the widening of Upper James Street to six lanes from the mountain brow to Limeridge Road.

b. East Hamilton - Stoney Creek Escarpment Corridor

The projected development in the Saltfleet Community and the eastern Hamilton mountain under the EASTERN alternative requires a major new mountain access route connecting to lower Hamilton and the Bay Front Industrial area somewhere between the Kenilworth access and the Highway 20 access. This could be accomplished by the construction of a four lane road facility along the previously proposed Parkdale Avenue Extension route with an additional connection via the Red Hill Creek Valley to Woodward Avenue.

c. East Downtown Hamilton Corridor

In addition to improvements to Lawrence Road, some further east-west road improvements are required between Hamilton and Stoney Creek. King Street should be reconstructed and widened to six lanes between Lawrence Road and Highway 20. Access between the Bay Front Industrial area and the industrial development area in Stoney Creek would be improved by extending Brampton Street easterly across the Red Hill Creek to join with the Q.E.W. service roads.

d. Stoney Creek East-West Corridor

The expansion of residential and industrial development in Stoney Creek will require improvements to main east-west arterial roadways to allow for traffic collection and distribution in the area. Highway 8 should be expanded to four lanes from Dewitt Road easterly to the Region's Boundary and Barton Street should be widened to four lanes east of Millen Road.

e. Stoney Creek North-South Corridor

The development in Stoney Creek also requires additional north-south road capacity between the Q.E.W. and Highway 8. Because of the existing location of interchanges on the Q.E.W. the additional capacity could best be provided by expanding both Fruitland Road and Fifty Road to four lanes.

f. Urban Transit Service

Conventional urban bus service should be expanded to include the total of lower Stoney Creek as well as new development areas in the Saltfleet Community, the Hamilton mountain and the developed areas of Dundas and Ancaster.

4.4 Additional Requirements for the WESTERN Land Use Alternative

The main area of transportation system improvements for the WESTERN land use alternatives is in the provision of additional capacity between the City of Hamilton and areas of development above the escarpment in Flamborough and the provision of an arterial road distribution system within the development area of Flamborough (See Figure 4-3).

a. Flamborough Escarpment Corridor

Access to the areas of development in Flamborough will require a minimum of three additional lanes of roadway crossing the escarpment in each direction.

Highway 6 between 403 and Highway 5 could be expanded to six lanes with an additional truck climbing lane in areas of severe grade, to accommodate that portion of travel demand oriented toward Waterdown. This expansion would require

improvements to the Highway 6 - Highway 403 interchange so as to allow direct connections from Highway 6 to the Perimeter Road and York Street.

Development in the Greensville, Bullocks Corners area will require improved escarpment access between Flamborough and Dundas. The travel demands could be accommodated by the following:

i) Reconstruction of the Highway 8 escarpment access to four lanes with provision for an additional truck climbing lane in areas of severe grade. This roadway would require an additional four lane north-south arterial connection above the escarpment and the provision of a four lane bypass of the Dundas business area below the escarpment. The bypass of downtown Dundas could be accomplished by the previously proposed reconstruction of Hatt Street.

ii) The lower approaches of the Sydenham Road access could be improved to allow for the utilization of the full capacity of the access portion. This should allow for a direct connection from Sydenham Road to the Hatt Street bypass.

iii) The Rock Chapel Road access could be extended to four lanes connecting to a four lane York Road below the escarpment. A four lane north-south connection will be required above the escarpment connecting this access to Highway 5.

b. West Downtown Hamilton Corridor

The additional projected traffic flow from Flamborough and Dundas to Hamilton will require improved road connections. The previously mentioned Aberdeen extension between Aberdeen Avenue and Cootes Drive will not be sufficient to alleviate the projected transportation deficiency in this corridor and a second new road connection will be required. This second connection can be achieved by joining Cootes Drive to the Industrial Perimeter Road along a path that follows the south shore of Cootes Paradise, passes over Highway 403 and tunnels under the Hamilton Cemetary and York Street.

In order to obtain the projected transit ridership in this corridor and to minimize the need for additional improvements, an exclusive right-of-way bus transit facility should be provided, joining downtown Hamilton to Highway 403 and points west. Because of the dispersed trip ends at the residential end including Burlington, Flamborough, Dundas, Ancaster and west Hamilton, it will be necessary that the transit technology be limited to surface bus transit operating on a separate right-of-way through the area of major congestion.

c. East Hamilton - Stoney Creek Escarpment Corridor

In order to provide a balance of transportation demand and capacity across the total Hamilton-Stoney Creek Escarpment Corridor and to provide sufficient access to development in the Saltfleet Community a new north-south connection is required between the Saltfleet Community and lower Hamilton.

The connection could be made by the proposed Parkdale Avenue Extension. The route would extend Parkdale Avenue southerly, utilizing the Mount Albion Road R.O.W., across the escarpment, thus joining it to Mud Street above the escarpment. Some improvements in alignment and geometrics would be required for Mountain Brow Boulevard between Limeridge Road and Mud Street to allow easy access from the eastern Hamilton mountain and the improved mountain access route.

d. Saltfleet Community and Hamilton East-West Corridor

Direct access between the Saltfleet Community Development and the Hamilton mountain could be improved by connecting Stone Church Road in Hamilton to Paramount Drive in the Saltfleet Community.

e. Urban Transit Service

The WESTERN alternative requires separate right-of-way transit facilities in both the Hamilton Escarpment Corridor and the West Downtown Hamilton Corridor. The urban surface bus coverage should be expanded to include the proposed development areas in Flamborough as well as the developed areas of Dundas, Ancaster and Stoney Creek.

4.5 Summary of Transportation System Requirements

Table 4-1 is a summary of all the transportation improvements required for the different land use development alternatives. The table gives a brief description of the improvements and indicates under which land use development alternatives they are required.

TABLE 4-1

REPRESENTATIVE TRANSPORTATION SYSTEM IMPROVEMENTS

CORRIDOR	ROUTE	DESCRIPTION						LAND USE REQUIRED FOR						
		FROM	TO	WIDTH (LANES)	LENGTH (MILES)	INCREASED CAPACITY (PHPDPT)	COST ($ MILLION)	TREND	SOUTH CENTRAL	SOUTH DECENTRAL	C.O.L.U.C.	EASTERN	WESTERN	CONGLOMERATE
Flamborough Escarpment Corridor	Hwy #6	Hwy #403	Hwy #5	5	2.0	700	5.	○	●	●	●	●		●
	Hwy #6	Hwy #403	Hwy #5	7	2.0	2500	7.						●	
	York - Chapel	Hwy #5	Cootes Dr.	4	4.2	2000							●	
	Hwy #8	Bullocks Corners	Head St. Dundas	5	1.	2000	20.0						●	
	Sydenham Rd.	Alma St.	King St.	-	-	800	1.						●	
Hwy #403 Hamilton-Burlington Corridor	Hwy #403	King St.	Q.E.W.	8	8.	2000	40.0	●	●	●	●	●	●	●
	Perimeter Rd.	Burlington St.	Hwy #6	4	3.7	2500	21.0	●	●	●	●	●		●
	Perimeter Rd.	Burlington St.	Hwy #6	6	3.7	4500	26.0						●	
West Downton Hamilton Corridor	Aberdeen Ext.	Aberdeen Ave.	Cootes Dr.	4	1.2	1000	4.0	●	●	●	●	●	●	●
	Aberdeen Ave.	Longwood Dr.	Queen St.	6	1	1000	2.0	●	●	●	●	●	●	●
	Cootes Paradise Route	Cootes Dr.	Perimeter Rd.	4	2.4	2000	5.0						●	
	Cootes Dr.	Thorpe St.	Boundary of Dundas & Hamilton	6	1	1500	2.0						●	
	Dundas Bypass (Hatt St.)	Napier St.	Cootes Dr.	4	1	2000	4.5						●	
	Hamilton West Transit R.O.W.	Downtown Hamilton	Hwy #403	NA	1.6	NA	50.0						●	

TABLE 4-1 CONT'D

REPRESENTATIVE TRANSPORTATION SYSTEM IMPROVEMENTS

CORRIDOR	ROUTE	DESCRIPTION						LAND USE REQUIRED FOR						
		FROM	TO	WIDTH LANES	LENGTH (MILES)	INCREASED CAPACITY (PHPDPT)	COST ($ MILLION)	TREND	SOUTH CENTRAL	SOUTH DECENTRAL	C.O.L.U.C.	EASTERN	WESTERN	CONGLOMERATE
Stoney Creek Escarpment	Becketts Dr.	Fennell Ave.	Charlton Ave.	4	1.25	1100	15.0	●	●	●	●			●
	Jolley Cut	Lower Approaches		NA	NA	900	0.5	●	●	●	●	●		●
	Upper James (Claremont)	Mtn. Brow	Limeridge Rd.	6	2.0	1200	5.0	●	●	●	●	●		●
	Parkdale Ave. Extension	Mud St.	Parkdale Ave.	4	2.25	1500	8.5						●	
	Parkdale Ave. Ext to Woodward	Mud St.	Woodward Ave.	4	3.4	2500	8.5	●	●	●	●	●		●
	Hamilton Mtn. Transit ROW	Downtown Hamilton	Mohawk Road	NA	2.1	NA	40.0	●	●	●	●	●	●	●
Hamilton - Corridor	Mountain Arterial	Hwy #403	Hamilton's East Boundary	4	7.4	2700	30.0	●	●	●	●	●		●
	Mud St.	City Boundary	Hwy #20	4	2.75	1000	3.0	●	●	●	●	●		●
	Stone Church Connection	Pritchard St.	Paramount Dr.	4	0.6	1000	0.25	●	●	●	●	●	●	●
East Downtown Hamilton Corridor	Lawrence Ave.	John St.	Kennilworth	4	3.0	1000	10.5	●	●	●	●	●	●	●
	Burlington St.	Parkdale Ave.	Q.E.W.	6	0.7	1000	1.0	●	●	●	●	●	●	●
	Brampton St.	Parkdale Ave.	Q.E.W. South Service Rd.	4	0.8	2000	1.5					●		
	Barton St.	Parkdale Ave.	Hwy #20	6	1.5	1500	3.0					●		
	King St.	Lawrence Ave.	Hwy #20	6	1.4	1500	4.0	●	●	●	●	●		●

TABLE 4-1 CONT'D

REPRESENTATIVE TRANSPORTATION SYSTEM IMPROVEMENTS

CORRIDOR	ROUTE	DESCRIPTION						LAND USE REQUIRED FOR						
		FROM	TO	WIDTH (LANES)	LENGTH (MILES)	INCREASED CAPACITY (PHPDPT)	COST ($ MILLION)	TREND	SOUTH CENTRAL	SOUTH DECENTRAL	C.O.L.U.C.	EASTERN	WESTERN	CONGLOMERATE
Flamborough Internal	Hwy #5	Region's Eastern Boundary	Hwy #6	4	4	1500	5.0	●	●	●	●	●	●	○
	Hwy #5	Hwy #6	Hwy #8	4	8	1500	8.0						●	
	Regional Rd. #4	Hwy #5	Hwy #8	4	1.5	1500	2.0						●	
Stoney Creek East West Corridor	Hwy #8	Dewitt Rd.	Fifty Rd.	4	4	1500	5.0					●		
	Barton St.	Grays Rd.	Fifty Rd.	4	4.5	1500	5.0					●		
Stoney Creek North-South Corridor	Fruitland Rd.	Q.E.W.	Hwy #8	4	1	1500	1.5	●	●	●	●	●	●	○
	Fifty Rd.	Q.E.W.	Hwy #8	4	0.75	1500	1.0					●		
Burlington Skyway - Beach Strip Corridor	Q.E.W.	Hwy #20	Guelph Line Burlington	8	9.0	5000	170.	●	●	●	●	●	●	●

All the land use development options require certain core or common transportation improvements. These include:

a. Major improvements in the two corridors between Hamilton and Burlington, including a separate right-of-way transit facility between downtown Hamilton and Burlington via the Highway 403 corridor.

b. A separate right-of-way transit connection between downtown Hamilton and the Hamilton mountain.

c. An additional east-west road connection joining downtown Hamilton to west Hamilton and Dundas.

d. Improvements to the east-west road connections joining downtown Hamilton to Hamilton east and Stoney Creek

e. An east-west by-pass of Waterdown

f. Improved transit service throughout the urban area.

The TREND, S. CENTRAL, S. DECENTRALIZED, C.O.L.U.C. and CONGLOMERATE land use options all require the same basic additional transportation system improvements. These include:

a. Improvements to and expansion of existing mountain access roads in the Hamilton Escarpment Corridor.

b. The construction of a new north-south road facility crossing the escarpment in the vicinity of the Saltfleet Community Development with direct connections to the Hamilton Bay Front Industrial Area.

c. The construction of a new east-west arterial road on the Hamilton mountain.

The EASTERN land use development option requires the following additional transportation system improvements:

a. Improvements to existing mountain access roads in the Hamilton Escarpment Corridors.

b. The construction of a new north-south road facility in the vicinity of the Saltfleet Community Development with direct connections to the Hamilton Bay Front Industrial Area.

c. Additional improvements to east-west roads joining Hamilton and Stoney Creek.

d. Improvements to the east-west and north-south arterial road network in lower Stoney Creek.

e. The construction of a new east-west arterial road on the Hamilton mountain.

The WESTERN land use development option requires the following additional transportation improvements:

a. Improvements to all mountain access routes into Flamborough.

b. Construction of a Highway 8 bypass route of downtown Dundas.

c. A direct connection between Cootes Drive and the Industrial Perimeter Road.

d. The construction of a six lane rather than a four lane Perimeter Industrial Road between Burlington Street and Highway 6.

e. The provision of a separate right-of-way transit facility in the West Downtown Hamilton corridor.

f. The construction of a north-south mountain access road in the vicinity of the Saltfleet Community Development joining Parkdale Avenue to Mud Street.

Not To Scale

Figure No. 4-1

LEGEND

SYSTEM IMPROVEMENTS:

- Major Road Widenings
- Major New Roads
- Separate R.O.W. Bus Transit
- Intermediate Capacity Transit
- Urban Transit Service Area

FACILITIES REQUIRING FURTHER STUDY:

1. Highway Bypass to the South of the Urban Area
2. Hamilton – Nanticoke Highway Connection
3. Hamilton Airport

Transportation Impacts of Development Alternatives

TRANSPORTATION SYSTEM IMPROVEMENTS

Required For The Trend, South Central, South Decentralized C. O. L. U. C. And Conglomerate Alternatives

Planning & Development Department
Hamilton – Wentworth Region

Not To Scale

Figure No. 4-2

LEGEND

SYSTEM IMPROVEMENTS:

- Major Road Widenings
- Major New Roads
- Separate R.O.W. Bus Transit
- Intermediate Capacity Transit
- Urban Transit Service Area

FACILITIES REQUIRING FURTHER STUDY:

1. Highway Bypass to the South of the Urban Area
2. Hamilton - Nanticoke Highway Connection
3. Hamilton Airport

Transportation Impacts of Development Alternatives

TRANSPORTATION SYSTEM IMPROVEMENTS

Required For The Eastern Alternative

Planning & Development Department
Hamilton - Wentworth Region

Not To Scale

Figure No. 4-3

LEGEND

SYSTEM IMPROVEMENTS:

- Major Road Widenings
- Major New Roads
- Separate R.O.W. Bus Transit
- Intermediate Capacity Transit
- Urban Transit Service Area

FACILITIES REQUIRING FURTHER STUDY:

1. Highway Bypass to the South of the Urban Area
2. Hamilton – Nanticoke Highway Connection
3. Hamilton Airport

Transportation Impacts of Development Alternatives

TRANSPORTATION SYSTEM IMPROVEMENTS

Required For The Western Alternative

Planning & Development Department
Hamilton - Wentworth Region

5.0 TRANSPORTATION RELATED IMPACTS OF ALTERNATIVE DEVELOPMENT PATTERNS

This section assesses various impacts of the alternative land use development patterns relative to the transportation system required to serve them. The impact of required improvements to the transportation system are assessed relative to cost and disruption of environmentally sensitive areas and existing communities. The impact of the operation of the transportation systems under the various land use options is assessed by relative measures of operating costs, transit usage and accessibility.

5.1 Environmental Impacts

The new or improved transportation facilities required to serve the alternative land use development options will have an impact on the areas surrounding them. The nature and degree of impact will depend on the type and size of transportation facility and the type of contiguous land use. The negative impacts of the transportation facilities on the abutting land uses will be caused, in part, by disruption due to actual construction and, in part, by the presence of the facility after construction (i.e., air and noise pollution and visual intrusion).

Techniques for predicting the environmental impacts on a system wide and Regional basis are very limited and cumbersome and require vast amounts of data. Therefore, it was necessary to develop a more pragmatic approach for the analysis based on some simplifying assumptions.

The first assumption concerns the type of transportation facilities to be considered to have a significant impact. For this analysis, only the new major expressway and arterial road

TABLE 5-1

ENVIRONMENTAL IMPACTS

OF REPRESENTATIVE TRANSPORTATION IMPROVEMENTS

FACILITY	ADDITIONAL LANES - ROAD	TRANSIT LANES	RESIDENTIAL SENSITIVE IMPACT MILES	ENVIRONMENTAL SENSITIVE IMPACT MILES	TOTAL MILES	RESIDENTIAL DISRUPTION MEASURE	ENVIRONMENTAL DISRUPTION MEASURE
Hwy 6	1-3		-	-	2.0	-	-
York-Chapel	2		0.3	0.8	4.2	0.3	1.6
Hwy 8 - Brock Rd.	2		0.8	0.6	2.5	0.8	1.2
Sydenham	2		-	-	-	-	-
Hwy 403	2		-	-	6.0	-	-
Perimeter Rd.	4		0.8	1.0	3.7	3.2	4.0
Perimeter Rd.	6		0.8	1.0	3.7	4.8	6.0
Aberdeen Ext.	4		1.0	-	1.2	4.0	-
Aberdeen Ave.	2		1.0	-	1.0	2.0	-
Cootes Paradise Route	4		-	1.8	2.4	-	7.2
Cootes Drive	2		-	0.8	1.0	-	1.6
Dundas Bypass	4		1.0	-	1.0	4.0	-
Hamilton West I.C.T.S.	-	2	0.5	-	1.6	1.0	-
Becketts Drive	2		0.5	0.7	1.0	1.0	1.4
Jolley Cut	-		-	-	-	-	-
Upper James	2		1.0	-	2.0	2.0	-
Parkdale Ave. Ext.	4		0.3	1.0	2.25	1.2	4.0
Woodward Connection	4		-	2.0	3.4	-	8.0
Hamilton Mountain I.C.T.S.	-	2	0.5	0.4	2.1	1.0	0.8
Mountain Arterial	4		-	-	7.4	-	-
Mud Street	2		-	-	2.75	-	-
Stone Church Road	2		-	-	0.6	-	-
Lawrence-Charlton	2		1.0	-	3.0	2.0	-
Burlington Street	2		-	-	0.7	-	-
Brampton Street	4		-	0.1	0.8	-	0.4
Barton Street-Hamilton	2		-	-	1.5	-	-
King Street	4		0.5	0.2	1.4	1.0	0.8
Hwy 5	2		-	-	12.0	-	-
Regional Road #4	2		-	-	1.5	-	-
Hwy 8 - S.C.	2		1.0	-	4.0	1.0	-
Barton St. - S.C.	2		1.5	-	-	1.5	-
Fruitland Road	2		0.8	-	1.0	0.8	-
Fifty Road	2		0.2	-	0.75	0.2	-
Q.E.W.	4		-	0.8	9.0	-	3.2

and separate R.O.W. transit facilities are considered.

The second assumption concerns the type of land use considered to be affected in a negative manner by the transportation facilities. The analysis was limited to areas that are either designated as environmentally sensitive or contain existing residential development. It has been assumed that commercial and industrial areas have a low sensitivity to impact and these impacts are not in the same order of magnitude as for residential and environmentally sensitive areas. Open space areas that are not parks or environmentally sensitive areas are not considered to be significantly impacted by transportation facilities.

The third assumption concerns the type of measure to be utilized in assessing the actual environmental impacts of the various land use options. It was decided that a representative measure would be the equivalent lane miles of intrusion of the transportation improvements on the environmental areas. The impact measures are based on the representative improvements shown in Figures 4-1, 4-2 and 4-3. The representative improvements were overlayed on aerial photographs and detailed land use maps to determine the length of transportation improvements affecting the different land use areas. The mileage was multiplied by the additional lanes of roadway required. Separate R.O.W. transit was considered to be equivalent to two lanes of roadway.

5.1.1 Disruption to Environmentally Sensitive Areas

The transportation related impacts on environmentally sensitive areas are a direct measure of the equivalent lane

miles of transportation improvements that are contained within those areas defined as environmentally sensitive[1]. These areas include areas of passive or active recreation, open space areas, areas of unique landscapes and areas necessary to support unique wildlife forms. Table 5-1 contains a list of the environmental impact measures related to each of the representative transportation improvements. The transportation related impact measures for the alternative land use development options are obtained by summing the impact measures for all the representative transportation improvements deemed necessary to support the alternative. Table 5-2 is a summary of environmental disruption measures by land use option. Table 5-4 lists the areas affected under each of the alternatives.

TABLE 5-2

TRANSPORTATION RELATED ENVIRONMENTAL DISRUPTION

FOR ALTERNATIVE LAND USE OPTIONS

LAND USE OPTION	MEASURE OF DISRUPTION TO ENVIRONMENTALLY SENSITIVE AREAS (LANE MILES)
TREND	17
S. CENTRAL	17
S. DECENTRALIZED	17
C.O.L.U.C.	17
CONGLOMERATE	17
EASTERN	17
WESTERN	26

[1] Environmentally sensitive areas as defined in Hamilton-Wentworth Region Environmentally Sensitive Areas Study - Ecologistics Ltd. (July 1975)

5.1.2 Disruption to Existing Residential Areas

The transportation related impact to existing residential areas is a weighted measure of the equivalent lane miles of transportation improvements contained in areas that are predominantly residential in nature. The weighting factors were developed subjectively and reflect whether the improvement is a new facility or an expansion of an existing facility, and reflect the type and density of the existing residential development. Table 5-1 contains a list of the residential disruption impact measures for the representative transportation improvements. These impact measures are summarized by land use (see Table 5-3) by adding up the impact measures for each of the representative transportation improvements necessary to support the land use option. Table 5-4 is a summary of the residential areas impacted under each alternative.

TABLE 5-3

TRANSPORTATION RELATED RESIDENTIAL DISRUPTION

FOR ALTERNATIVE LAND USE OPTIONS

LAND USE OPTION	MEASURE OF DISRUPTION TO RESIDENTIAL AREAS (WEIGHTED LANE MILES)
TREND	16
S. CENTRAL	16
S. DECENTRALIZED	16
C.O.L.U.C.	16
CONGLOMERATE	16
EASTERN	19
WESTERN	22

TABLE 5-4

AREAS IMPACTED BY TRANSPORTATION IMPROVEMENTS

LAND USE OPTION	TRANSPORTATION IMPACTS	
	ENVIRONMENTALLY SENSITIVE AREAS IMPACTED	RESIDENTIAL AREAS IMPACTED
TREND S. CENTRAL S. DECENTRAL CONGLOMERATE C.O.L.U.C.	1. Flamborough Escarpment Face 2. Hamilton Harbour 3. Botanical Gardens 4. Red Hill Creek and Van Wagners Marshes 5. Red Hill Creek Valley 6. Hamilton Escarpment Face	1. Hamilton North End 2. Hamilton West 3. Central Hamilton Mountain 4. Central Hamilton
EASTERN	1. Flamborough Escarpment 2. Hamilton Harbour 3. Botanical Gardens 4. Red Hill Creek and Van Wagners Marshes 5. Red Hill Creek Valley	1. Hamilton North End 2. Hamilton West 3. Central Hamilton Mountain 4. Central Hamilton 5. East Hamilton 6. Stoney Creek
WESTERN	1. Flamborough Escarpment 2. Hamilton Harbour 3. Botanical Gardens 4. Red Hill Creek and Van Wagners Marshes 5. Spencers Gorge 6. Boers Falls - Rock Chapel 7. Cootes Paradise	1. Greensville 2. Dundas 3. Hamilton West 4. Hamilton North End 5. Central Hamilton

5.2 Cost Impacts

The different transportation system improvements required to support each of the land use development options have definite cost implications. These costs are one measure of the transportation related impacts and the variation of these costs between the land use development alternatives is one measure of the variation of impacts of the alternatives. The transportation costs are made up of two components, the capital cost of constructing the transportation improvements and the operating and maintenance costs of the transportation system in operation. The capital costs are affected only by the improvements required. The operating costs are affected by the existing transportation system as well as the improvements to the system. Capital costs include total expenditures up to the horizon year, operating and maintenance costs are usually expressed as annual costs.

The cost estimates developed for this analysis are meant only as gross indicators for purposes of comparison. The absolute value of cost estimates for any improvement or systems operations are accurate only within an order of magnitude and should not be used outside this context.

5.2.1 Capital Costs

For purposes of comparison, the capital cost estimates will include only the costs associated with the implementation of the major transportation system improvements required to support each of the land use development alternatives. (The transportation systems are described in chapter 4 of this report). The costs are based on the representative

TABLE 5.5

CAPITAL COSTS TO THE YEAR 2001

FOR MAJOR TRANSPORTATION SYSTEM IMPROVEMENTS

LAND USE OPTION	ROAD COSTS ($ MILLION)*			TRANSIT + COSTS ($ MILLION)*	TOTAL PROVINCIAL COSTS ($ MILLION)*	TOTAL REGIONAL COSTS # ($ MILLION)*	TOTAL CAPITAL COSTS ($ MILLION)*
	TOTAL	PROVINCIAL FACILITIES	REGIONAL + FACILITIES				
TREND S. CENTRAL S. DENCENTRALIZED C.O.L.U.C. CONGLOMERATE	322	220	102	40	301	61	362
EASTERN	332	225	107	40	308.5	63.5	372
WESTERN	331	250	81	90	358	63	421

NOTE: * 1975 Dollars

+ Before Provincial Subsidy

After Provincial Subsidy

transportation improvements and are summarized for each facility improvement in Table 4-1. Other capital expenditures for transportation related facilities will be required under all the alternatives, but the analysis techniques available are not refined enough to detect differences in these costs between alternatives. It is therefore assumed that the capital costs of transportation improvements that do not relate to the capacity of major roadways and transit corridors will not vary significantly between land use alternatives.

Table 5-5 shows the total capital costs for road and transit improvements up to the year 2001. It is assumed that existing policies on cost sharing will be in effect. If the improvement is to a Provincial highway, it is assumed that the Province will pay 100 percent. All other road improvements are assumed to be Regional roads with the cost shared between the Province and the Region, on a fifty-fifty basis. For major transit improvements, it is assumed that the Province will pay 75 percent of costs and the Region will pay 25 percent.

The summary of capital costs shows insignificant variation in costs between all alternatives except for the WESTERN. The total capital costs for the WESTERN alternative are greater than the other alternatives by approximately 13 percent. The assumptions concerning responsibility for cost and cost sharing suggest that the cost to the Region will not be significantly different than the other alternatives and that the Province will pay the extra. However, any change in the policies on which the cost sharing and cost

allocation assumptions are based will affect the status of the WESTERN alternative's impact on the Region relative to the other alternatives.

5.2.2 Operating and Maintenance

Maintenance costs for roads are dependent on the total road system and can be related to the miles of road by road type classification. Since the population and employment totals and the density of development do not vary between the development alternatives, there will be no great variation in total miles of roadway requirements. The only variation between alternatives will be in the location and size of major roadway improvements. Since these account for a small percentage of the total road mileage, it can be assumed that there will be an insignificant variation in road maintenance costs between land use development alternatives.

The cost to the municipality of transit service is the subsidy payments required to make up the difference between the cost of operation and the revenue brought in by fares. Transit operating deficits vary with the total transit ridership and the transit miles of operation necessary to serve the riders. The modal split forecasts for the different land use alternatives estimate that the total transit ridership will not vary significantly between the development options. However, because of the differences in the spatial allocation of the alternatives, the bus miles of service required will vary.

A relationship was established between gross yearly transit deficit and yearly transit passenger miles of travel, utilizing available data. The base year (1972) deficit figure used includes costs for labour, vehicle operation and maintenance, management and depreciation. The yearly passenger miles of travel were derived from a transit origin-destination survey[1] done for the H.S.R. in 1972. The relationship between transit passenger miles of travel and gross deficit has been assumed to remain constant through time. The travel forecast model was used to predict the transit passenger miles of travel for each of the alternative land use plans and the associated operating deficit was then calculated.

Table 5-6 is a summary of the estimated transit operating deficits for the year 2001 under the alternative land use development options. Under existing policy, the Provincial government pays approximately 50 percent of this gross operating deficit. It is assumed that this policy will continue and Table 5-6 shows the yearly Regional and Provincial share of the transit deficit costs. The variation of the gross transit deficit between the land use alternatives is approximately 17 percent between low and high deficit cost. The WESTERN alternative is calculated to have the highest yearly transit deficit due to the greater distance required to supply transit connections to development above the escarpment in Flamborough. The more centralized alternatives show a higher transit operating deficit due to a higher estimated transit ridership.

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1. Hamilton Transit Study - De Leuw Cather, (March 1972)

TABLE 5-6

FORECASTED TRANSIT OPERATING DEFICITS FOR THE YEAR 2001

LAND USE	YEARLY TRANSIT OPERATING DEFICIT ($ MILLION)*		
	TOTAL	REGION	PROVINCE
TREND	14.3	7.15	7.15
SOUTH CENTRAL	15.1	7.55	7.55
SOUTH DECENTRAL	14.5	7.25	7.25
C.O.L.U.C.	14.9	7.45	7.45
CONGLOMERATE	13.7	6.85	6.85
EASTERN	14.0	7.00	7.00
WESTERN	16.1	8.05	8.05

NOTE: * 1975 dollars

The cost data developed in this report were used in conjunction with a financial model to develop yearly per capita costs for the various alternatives. The financial model was set up to analyze the total financial impacts of the various alternatives on the budgets of the Region and the municipalities within the Region. A summary of the per capita costs is shown in Table 5-7 for the years 1986 and 2001. These costs are to be used for relative comparison only because assumptions have been made regarding financial responsibility, cost sharing and amortization of capital debt programmes.

The per capita costs include an estimate of costs for maintenance and operation, before provincial subsidy plus an estimate of debt payments arising from the Regional share of capital costs for major capital projects. (It was necessary to make assumptions concerning the staging of capital projects and the financing of the Regional share of capital expenditures). The per capita costs, as displayed in table 5-7 must be covered by Provincial operating subsidies and Regional levies.

5.3 Transit Usage

The extent to which a development concept lends itself to the efficient promotion or utilization of public transit was another criterion selected for evaluation of the transportation

TABLE 5-7

YEARLY PER CAPITA COSTS+ (1975 DOLLARS)

FOR ALTERNATIVE LAND USE OPTIONS

	ROAD		TRANSIT	
LAND USE	1986	2001	1986	2001
TREND	$14.64	$18.50	$22.20	$28.17
S. CENTRAL	14.64	18.50	22.93	29.63
S. DECENTRALIZED	14.64	18.50	22.37	28.51
C.O.L.U.C.	14.64	18.50	27.70	29.17
CONGLOMERATE	14.64	18.50	21.63	27.02
EASTERN	14.16	18.07	21.89	27.56
WESTERN	12.47*	14.87*	26.87	34.14

* Lower per capita costs resulting from a higher portion of improvements on Provincial Roads.

+ Costs before Provincial subsidies.

impacts of the alternative land use options. It was recognized that public transit will have to play an increasingly important role in relieving peak-period travel demand deficiencies within the urban area. This future role of public transit within and between urbanized areas is further evidenced by:

(a) recent decisions against the construction of freeways in urban areas;

(b) increasing energy costs coupled with the potential savings (increased efficiency) realized with transit as compared to the private auto;

(c) environmental and/or physical restrictions peculiar to the Hamilton-Wentworth Region which may require maximizing the potential capacity of available rights-of-way, e.g., (Niagara Escarpment, Hwy 403 isthmus) in order to maintain the level of accessibility required to achieve the related development objectives.

Total estimated future transit ridership (in the peak hour) was the measure used to compare the relative degree of compatibility of the alternative land use options with the goal of encouraging increased use of public transit.

Since the total population (and thus total number of person trips) was constant for all alternatives, the amount of transit ridership can be more simply characterized by an overall peak hour modal split, that is, the percentage of total travel using public transit (See Appendix E for detailed modal split data).

No significant difference was found to exist among the alternatives with respect to their relative propensity to encourage transit usage. Year 2001, total peak hour transit riderships of approximately 34,000[1] (± 3%) were forecasted for all land use options, which represents an overall modal split of about 20% (expressed as a percentage of internal travel). Total forecasted peak hour, peak direction transit riderships out of Hamilton's C.B.D. ranged from 13,200 to 14,400, about a 45 percent modal split. (See Table E-4, Appendix E)

The primary reasons for the absence of any significant difference among the alternatives in terms of future transit usage are:

(a) the degree of similarity between the land use option in terms of total number of people and size and configuration of the future urban area (see section 5.4 for further details); and,

(b) the consistency of the application of the modal split assumptions which are partially based on the (similar) nature of land uses at the trip ends.

With regard to point b (above) it was necessary to develop a measure of transit system efficiency which would demonstrate the impacts on the transit system (if any) of locating a similar amount and nature of future urban growth in different spatial locations.

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1. Includes all trips within the Hamilton-Wentworth Region plus approximately 4,500 trips from/to the City of Burlington.

The mean transit trip length (in miles) was estimated for each of the alternative land use options. This was assumed to be a proportionally consistent measure of the amount of transit service (in terms of bus miles) that would be required to achieve the forecasted transit riderships (see Appendix F).

It was determined that the WESTERN alternative was significantly less efficient in terms of extension of transit service in that it would require up to 10% more bus miles of service than the other alternatives to achieve similar levels of ridership. No significant difference in transit system efficiency was found among the remaining six alternative development concepts.

5.4 Accessibility

Accessibility was selected as one criterion for evaluating the transportation impacts of the alternative development concepts because it was felt that there was a present and increasing concern over the amount of time spent on travel. The assumption regarding the future importance of accessibility was based, not only on the growing desire for more opportunities for leisure activities, but also on the impending future shortages of energy.

The mean trip lengths (as simulated by the transportation model for the year 2001) from a person's home to their place of work and shopping were chosen as the measures of the degree of accessibility afforded by a particular development concept. It was felt that the average trip lengths resulting from a particular spatial distribution of jobs and people would be representative of the ease of interaction or travel for the land use under

consideration. While the effects of congestion (due to overloading of certain corridors) on accessibility are not directly accounted for by the model, this is not a problem since the assumption was made that any transportation facilities required to serve the travel demands of each development concept would be provided.

Examination of the future mean trip lengths indicates that there is no significant difference in the level of accessibility provided by the alternative land use options. The forecasted average times required (in the year 2001) to travel to and from one's place of work or shopping are 15.3 and 12.7 minutes respectively; however, the variation about these means is insignificant (less than $\pm$ 2%).

The conclusion regarding the similarity of levels of accessibility between the alternatives is not surprising in light of the following considerations:

a. The total forecasted increase in the number of people and jobs within the Region (to the year 2001) is only about 35% and 90% respectively (compared to 1975) and is constant for all land use options.

b. Approximately one half of the total population growth is distributed in similar locations for all alternatives.

c. The nature of the future urban areas is similar in configuration (since a large component of it in the City of Hamilton, Dundas, Ancaster and

Stoney Creek is common to all alternatives) and identical in terms of the number of people allocated to it (i.e., 410,000 persons).

Accessibility then, viewed alone, shows an insignificant difference between the transportation impacts of the alternative development concepts.

5.5 Summary of Transportation Related Impacts

A number of transportation related impact measures were utilized to assess the relative impact of the alternative land use development options. The measures include: capital cost of transportation improvements, yearly operating deficit of the urban transit system, disruption to existing residential development, disruption to environmentally sensitive areas, relative use and efficiency of transit service and relative accessibility. The impact measures are summarized by land use alternative in Table 5-8.

Accessibility and transit usage measures showed no significant variation between any of the land use alternatives. Total capital costs were highest for the WESTERN alternative, with no significant difference between the other alternatives. Transit operating deficits were highest for the WESTERN alternative with the two centralized plans (S. CENTRAL and C.O.L.U.C.) being the next highest and all other alternatives being similar. The community disruption measure was highest for the WESTERN, with the EASTERN being the next highest, and all other alternatives showing no variation. The environmental disruption measure showed the WESTERN alternative to have a significantly higher impact than the other alternatives which showed no variation among themselves.

TABLE 5-8

TRANSPORTATION RELATED IMPACTS OF ALTERNATIVE LAND USE DEVELOPMENT OPTIONS

LAND USE ALTERNATIVE	CAPITAL COST* ($MILLION)				YEARLY*+ TRANSIT OPERATING DEFICIT ($ MILLION)	DISRUPTION MEASURES		ACCESSI-BILITY INDEX (MINUTES)	TRANSIT USAGE (PERCENT) MODAL SPLIT
	ROAD		TRANSIT+	TOTAL		COMMUNITY	ENVIRONMENT		
	PROV.	REGION+							
Trend S.Decentral Conglomerate	220	102	40	362	14	16	17	14.4	20.0
S.Central C.O.L.U.C.	220	102	40	362	15	16	17	14.3	20.1
Eastern	225	107	40	372	14	19	17	14.4	19.7
Western	250	81	90	421	16	22	26	14.5	20.0

* 1975 Dollars

+ Before Provincial Subsidy

Table 5-9 shows the ranking of the alternatives relative to each of the transportation related goals. The land use alternative with the highest ranking value, best achieves the goal. This shows that there is no significant difference in the TREND, SOUTH CENTRAL, SOUTH DECENTRAL, C.O.L.U.C. and CONGLOMERATE alternatives. The EASTERN alternative is ranked lower for one goal achievement measure and the WESTERN is ranked lowest in four of the goal achievement measures.

TABLE 5-9

RANKING[1] OF ALTERNATIVES

RELATIVE TO TRANSPORTATION RELATED GOALS

LAND USE ALTERNATIVE	MINIMIZE TRANSPORTATION CAPITAL COST	MINIMIZE TRANSIT OPERATING COST	MINIMIZE COMMUNITY DISRUPTION DUE TO NEW TRANSPORTATION FACILITIES	MINIMIZE ENVIRONMENTAL DISRUPTION DUE TO NEW TRANSPORTATION FACILITIES	MINIMIZE TRAVEL TO PLACES OF WORK AND SHOPPING	ENCOURAGE GREATER USE OF PUBLIC TRANSIT	ENCOURAGE EFFICIENT USE OF PUBLIC TRANSIT
Trend	2	2	3	2	NO SIGNIFICANT DIFFERENCE	NO SIGNIFICANT DIFFERENCE	2
S.Central	2	2	3	2			2
S.Decentral	2	2	3	2			2
C.O.L.U.C.	2	2	3	2			2
Conglomerate	2	2	3	2			2
Eastern	2	2	2	2			2
Western	1	1	1	1			1

NOTES: 1. The highest ranking value best achieves the goal.

APPENDIX A

TRAFFIC ZONE MAP

PLANNING DIVISION MAP

TRAFFIC ZONES

THE REGIONAL MUNICIPALITY OF HAMILTON - WENTWORTH
And The City of Burlington

PLANNING AND DEVELOPMENT DEPARTMENT
HAMILTON

Not To Scale

Sept. 76

PLANNING DIVISIONS

APPENDIX B

LAND USE BY PLANNING DIVISION

TABLE B-1

TOTAL 2001 POPULATION BY PLANNING DIVISION

Municipality	Planning Division	1971 Population	#1 Trend	#2 Eastern Alternative	#3 COLUC Alternative	#4 South Central	#5 South Decentralized	#6 Western Alternative	#7 Conglomerate
Flamborough	11	5,643	7,000	7,000	7,000	7,000	7,000	7,500	7,000
	12	1,975	2,200	2,200	2,200	2,200	2,200	2,200	2,200
	13	3,845	5,000	5,000	5,000	5,000	5,000	5,500	5,000
	14	4,280	7,000	7,000	7,000	7,000	7,000	18,000	9,400
	15	5,232	4,900	4,900	4,900	4,900	4,900	57,800	8,400
		20,975	26,100	26,100	26,100	26,100	26,100	91,000	32,000
Dundas	21	1,430	2,500	2,500	2,500	2,500	2,500	2,500	2,500
	22	17,205	18,500	18,500	18,500	18,500	18,500	18,500	18,500
		18,635	21,000	21,000	21,000	21,000	21,000	21,000	21,000
Ancaster	31	11,310	33,700	14,800	18,700	13,700	28,700	14,800	19,000
	32	3,855	4,500	4,500	4,500	4,500	4,500	4,500	4,500
		15,165	38,200	19,300	23,200	18,200	33,200	19,300	23,500
Glanbrook	41	6,110	8,000	8,000	8,000	13,000	8,000	8,000	7,500
	42	3,825	6,600	6,600	6,600	6,600	6,600	6,600	14,500
		9,935	14,600	14,600	14,600	19,600	14,600	14,600	22,000
Stoney Creek	51	17,475	31,000	34,000	31,000	31,000	31,000	25,000	34,000
	52	5,795	16,500	41,000	11,500	11,500	11,500	7,500	8,900
	53	2,250	2,600	4,000	2,600	2,600	2,600	2,600	2,600
	54	1,850	25,000	35,000	25,000	25,000	25,000	14,000	31,000
		27,370	75,100	114,000	70,100	70,100	70,100	49,100	76,500
Hamilton	61	7,355	7,000	7,000	7,000	7,000	7,000	7,000	7,000
	62	11,325	3,000	3,000	3,000	3,000	3,000	3,000	3,000
	63	3,105	ø	ø	ø	ø	ø	ø	ø
	64	14,625	35,800	35,800	35,800	35,800	35,800	35,800	35,800
	65	49,085	47,000	47,000	47,000	47,000	47,000	47,000	47,000
	66	55,755	51,500	51,500	51,500	51,500	51,500	51,500	51,500
	67	27,310	33,000	33,000	36,000	36,000	33,000	33,000	33,000
	68	20,390	19,500	19,500	21,500	20,500	19,500	19,500	19,500
	69	18,685	20,000	20,000	20,500	20,000	20,000	20,000	20,000
	71	22,205	28,000	28,000	31,000	32,000	29,000	28,000	28,000
	72	51,290	52,500	52,500	56,500	56,500	52,500	52,500	52,500
	73	21,975	26,000	26,000	26,000	26,000	27,000	26,000	26,000
	74	840	5,500	5,500	5,500	5,500	6,000	5,500	5,500
	75	2,685	27,200	15,700	30,200	30,200	32,200	15,700	27,200
	76	2,610	19,000	10,500	23,500	24,000	21,500	10,500	19,000
		309,240	375,000	355,000	395,000	395,000	385,000	355,000	375,000
Regional Total		401,320	550,000	550,000	550,000	550,000	550,000	550,000	550,000

TABLE B-2

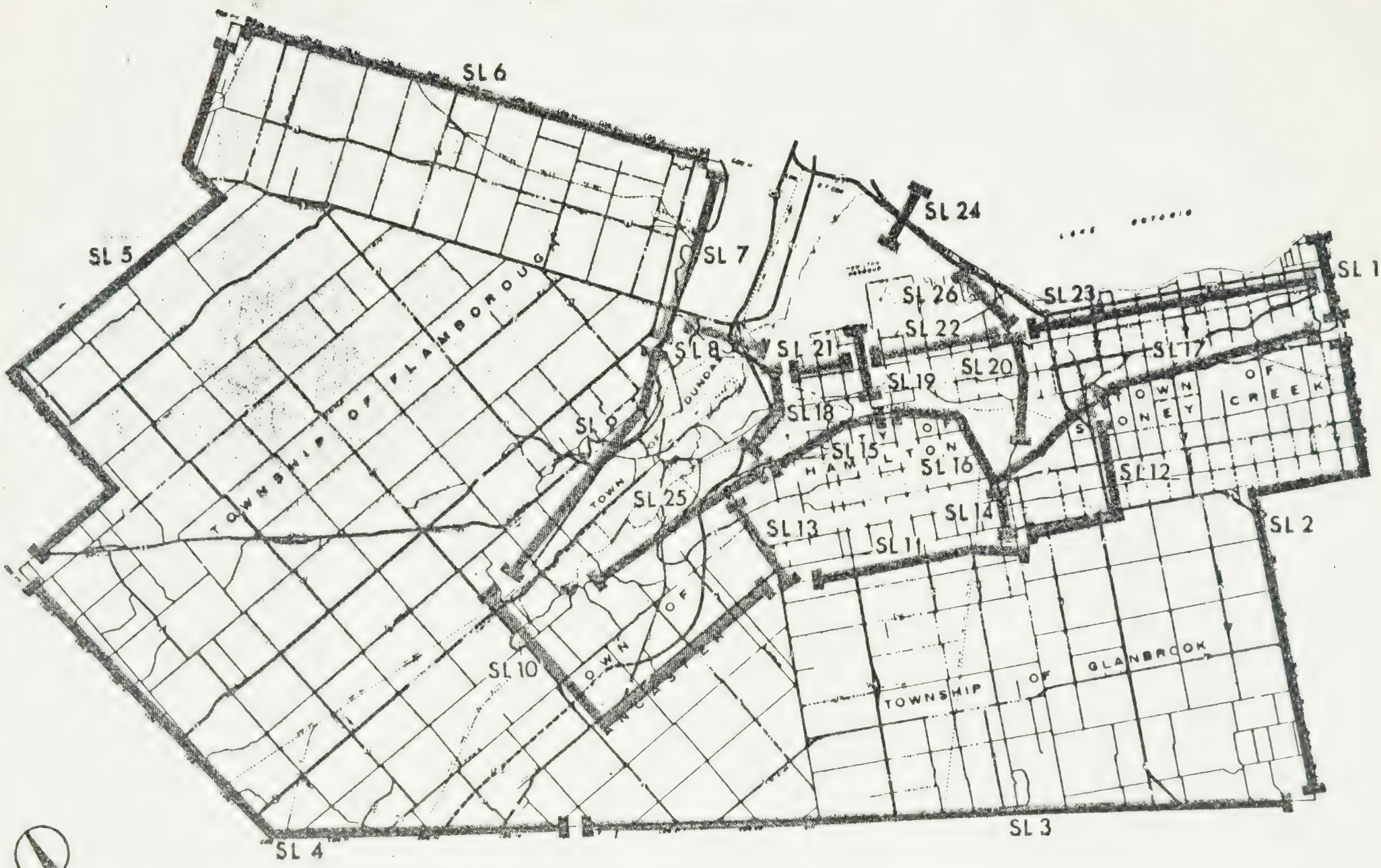
TOTAL 2001 EMPLOYMENT BY PLANNING DIVISION

Municipality	Planning Division	1971 Employment	#1 Trend	#2 Eastern	#3 COLUC	#4 South-Central	#5 South-Decentralized	#6 Western	Conglomerate
Flamborough	11	750	1,165	1,175	1,165	1,175	1,175	1,185	1,175
	12	487	870	870	870	870	870	870	955
	13	618	1,015	1,015	1,015	1,015	1,025	1,035	1,180
	14	828	1,425	1,280	1,280	1,280	1,280	4,250	1,615
	15	762	1,485	1,335	1,485	1,485	1,485	9,960	2,100
		3,445	5,960	5,675	5,815	5,825	5,835	17,300	7,025
Dundas	21	462	1,095	1,095	1,095	1,095	1,095	1,095	1,095
	22	4,108	5,415	5,415	5,415	5,415	5,415	5,415	5,415
		4,570	6,510	6,510	6,510	6,510	6,510	6,510	6,510
Ancaster	31	1,327	4,545	3,265	3,520	3,265	4,510	3,375	3,720
	32	658	1,415	1,425	1,415	1,425	2,815	2,825	2,355
		1,985	5,960	4,690	4,935	4,690	7,325	6,200	6,075
Glanbrook	41	940	3,850	2,270	9,430	9,935	7,920	2,370	4,355
	42	570	995	995	995	995	995	995	2,095
		1,510	4,845	3,265	10,425	10,930	8,915	3,365	6,450
Stoney Creek	51	4,722	12,460	13,750	12,460	12,460	16,860	12,460	12,350
	52	1,679	10,920	15,910	3,790	3,790	3,790	3,790	10,180
	53	318	1,035	1,035	1,035	1,035	1,035	1,035	1,035
	54	121	3,570	5,270	5,270	5,270	5,270	2,820	4,970
		6,840	27,985	35,965	22,555	22,555	26,955	20,105	28,535
Hamilton	61	1,962	2,650	2,650	2,650	2,650	2,650	2,650	2,650
	62	47,405	53,735	53,735	53,735	53,735	53,735	53,735	53,735
	63	169	210	210	210	210	210	210	210
	64	4,451	11,350	15,150	11,350	11,350	11,350	11,350	11,300
	65	9,305	12,605	12,605	12,605	12,605	12,605	12,605	12,605
	66	18,744	23,355	22,855	22,855	22,855	22,855	22,855	22,655
	67	30,360	75,360	70,075	76,880	69,660	71,560	75,750	76,475
	68	6,391	10,990	10,990	10,990	10,990	10,990	10,990	10,940
	69	5,958	10,200	10,200	10,200	10,200	10,200	10,200	10,200
	71	4,654	7,635	7,635	7,635	7,635	7,635	7,635	7,635
	72	6,778	11,570	10,900	11,570	16,650	11,570	11,570	11,570
	73	1,414	2,470	2,470	2,470	2,470	2,470	2,470	2,470
	74	314	11,680	11,680	11,680	11,680	11,680	11,680	9,390
	75	391	3,140	2,270	3,140	5,010	3,140	2,350	2,900
	76	219	1,790	470	1,790	1,790	1,810	470	670
		138,515	238,740	233,895	239,760	239,490	234,460	236,520	235,405
Regional Total		156,865	290,000	290,000	290,000	290,000	290,000	290,000	290,000

APPENDIX C

SCREENLINE DESCRIPTIONS

SCREENLINE LOCATIONS



Not To Scale

SCREEN LINES

SL-1

This screenline extends along the eastern boundary of the study area (below the escarpment), between Lake Ontario and the Niagara Escarpment. It intersects the Hamilton - St. Catharines corridor.

Major roads crossing are:
- Q.E.W.
- Highway #8

Minor roads crossing are:
- Base Line Road
- North & South Service Roads

SL-2

This screenline extends along the eastern boundary of the Hamilton-Wentworth Region (above the escarpment), between the escarpment and the South-East corner of the Regional Boundary.

Major roads crossing are:
- Highway #20
- Regional Road 25A
- Regional Road 11
- Regional Road 50
- Regional Road 22

Minor roads crossing are:
- Smith Road
- Highland Road
- 9th Road East
- 8th Road East
- 7th Road East
- Golf Club Road
- 2nd Concession Road
- 7th Concession Road
- 8th Concession Road
- 9th Concession Road

SL-3

This screenline follows the southern edge of the study area from the South-East corner of the Hamilton-Wentworth Region, west, to the Brantford-Onondaga Township line.

Major roads crossing are:
- Highway #56
- Highway #6
- Regional Road 13
- Regional Road 33 (Tyneside Road)
- County Road 22 (Trinity & Carluke Road)

Minor road crossings are:
- Road allowance between lots, 30 & 31.
- 28 & 29
- 24 & 25
- 20 & 21
- Trinity Church Road

Miles Road
Ferris Road
Glancaster Road
Nodsworth Road
Shaver Road
Carlduke Road
Trinity Road
Butter Road

SL-4

This screenline extends along the southern boundary of the Hamilton-Wentworth Region from the Brantford-Onondaga Township Line (just east of Highway #2), up to, but not including Highway #8. It intercepts the Hamilton-Brantford corridor.

Major road crossings are:
Highway #2
Highway #99
Highway #5
County Road 17
County Road 14

Minor roads crossing are:
Alberton Road
Book Road
Ferguson Road
Parsonage Road
Ronald Road
Misener Road
Powerline Road
Harrisburg Road
2nd Concession Road
Patric Road
5th Concession Road
6th Concession Road
7th Concession Road
Maclean Road

SL-5

This screenline extends along the northern boundary of Flamborough Township from Highway #8 (inclusive), east, to the regional boundary between Halton & Wellington. It contains the K/W-Hamilton and Guelph-Hamilton corridors.

Major roads crossing are:
Highway #8
Highway #97 & 52
Highway #52
Highway #6

Minor roads crossing are:
Studiman By-Road
Clyde Side Road
Sheffield By-Road
8th Concession Road
10th Concession Road
Foreman Side Road

Valens Side Road
Lennon Side Road
11th Concession Road
14th Concession Road
Centre Road

SL-6

This screenline extends along the eastern boundary of Flamborough Township from the corner nearest Highway #401, south-east to the Niagara escarpment.

Major roads crossing are: Highway #5
County Road 18
County Road 36

Minor roads crossing are: Mountsberg Road
11th Concession Road
10th Concession Road
9th Concession Road
8th Concession Road
7th Concession Road
6th Concession Road
5th Concession Road
4th Concession Road

SL-7

This screenline extends along the southern boundary of Flamborough (the escarpment) between King Road (inclusive) and Highway #6 (inclusive). It cuts across the Guelph-Hamilton/Burlington corridor.

Major roads crossing are: Highway #6

Minor roads crossing are: Waterdown Road
Snake Road

SL-8

This screenline runs parallel to Highway #6 (on the west side) from the Niagara escarpment down to Hamilton Harbour. It intersects the Toronto/Burlington-Hamilton corridor.

Major roads crossing are: Highway #403
Highway #2
York Road

Minor roads crossing are: Old Guelph Road
Heath Street

SL-9

This screenline extends along the escarpment i.e.(the boundary between Flamborough and Ancaster), from Highway #6 (exclusive) to Highway #99 (exclusive).

Major roads crossing are: Highway #8
Regional Road 5 (Sydenham)

Minor roads crossing are: Valley Road
Wier Side Road
Binkley Road

SL-10

This screenline runs parallel to Highway #52 (on the east side) from Highway #99 (inclusive) south to Highway #2 (inclusive), then extends east, parallel to Highway #2/53 (on the southern side), to the City of Hamilton Limits.

Major roads crossing are: Highway #99
County Road 23
Highway #2
County Road 16
County Road 48

Minor roads crossing are: Mineral Springs Road
Powerline Road
Shaver Road
Smith Road

SL-11

This screenline runs along the southern city limits immediately south of Highway 53 (Rymal Road).

Major roads crossing are: Highway #6

Minor roads crossing are: Aldercrest Avenue
Seneca Avenue
Springside Drive
Miles Road
Nebo Road
Glover Road
Trinity Church Road
Glancaster Road

SL-12

This screenline extends along Highway 53 (on the southern side) from Trinity Church Rd. (exclusive)up to, but not including First Road East (of Highway 20) in Stoney Creek, then directly north to the escarpment.

Major roads crossing are: Highway #20
Highway #56
Regional Road 11
Regional Road 40

Minor roads crossing are: Highland Road
Green Mountain Road

SL-13

This screenline runs along the western Hamilton City Limits on the mountain between Highway #53 (inclusive) and the escarpment.

Major roads crossing are: Highway #53
Mohawk Road
Proposed Mountain Freeway

Minor roads crossing are: Golf Club Road

SL-14

This screenline extends along the eastern Hamilton City Limits on the mountain from Highway #53 (inclusive) to the escarpment.

Major roads crossing are: Highway #53 (Rymal Road)
Proposed Mountain Freeway (possibly)

Minor roads crossing are: Highland Road
Mud Street

SL-15

This screenline extends along the escarpment from Highway #403 (exclusive) to just east of the Upper Wentworth Street. It includes the major wester mountain accesses.

Major roads crossing are: Beckett Drive (Queen Street access)
James Street Mountain Road
Claremont Access
Jolley Cut

SL-16

This screenline extends along the escarpment from Wentworth Street to just east of Highway #20.

Major roads crossing are: Sherman Access
Kenilworth Access
Mount Albion Road
Highway 20

SL-17

This screenline extends along the escarpment between Highway #20 (exclusive) and the eastern edge of the Hamilton-Wentworth Region.

Major roads crossing are:
New Mountain Road
Regional Road 50

Minor roads crossing are:
Dewitt Road
McNeilly Road

SL-18

This screenline is located to the east of Highway #403 between Hamilton Harbour and the escarpment. It intersects the western approaches to Hamilton's CBD below the mountain.

Major roads crossing are:
Aberdeen Avenue
Main Street
King Street
York Blvd.

Minor roads crossing are:
Fred Street

SL-19

This screenline runs parallel to Wentworth Street (on the west side) from the Harbour to the escarpment. It intersects cross-town, east-west traffic.

Major roads crossing are:
Charlton Avenue
Main Street East
King Street East
Cannon Street
Barton Street
Burlington Street
Proposed Perimeter Road

Minor roads crossing are:
Stinson Street
King William Street
Nightingale Street
Wilson Street
Century Street
Birge Street
Shaw Street
Burton Street
Ferrie Street

SL-20

This screenline intercepts the eastern approaches to Hamilton's CBD. It extends along the Red Hill Creek from North of Barton

Street to the escarpment.

Major roads crossing are:
- King Street East
- Queenston Road
- Barton Street

Minor roads crossing are:
- Hixon Street
- Melvin Avenue

SL-21

This screenline is located along the CN mainline between the Harbour and Wentworth Street (exclusive).

Major roads crossing are:
- James Street
- Wellington Street

Minor roads crossing are:
- Bay Street
- McNab Street
- John Street
- Mary Street
- Ferguson Avenue
- Victoria Avenue

SL-22

This screenline is located along the CN mainline between Wentworth Street (inclusive) and Red Hill Creek. It separates the Bayfront Industrial area from most of the major east-west arterial links.

Major roads crossing are:
- Wentworth Street
- Birch Avenue
- Sherman Avenue
- Gage Avenue
- Ottawa Street
- Kenilworth Avenue
- Parkdale Avenue
- Woodward Avenue

Minor roads crossing are:
- Lottridge Street
- Avondale Avenue

SL-23

This screenline is located along the CN mainline between the Red Hill Creek and the eastern edge of the Hamilton-Wentworth Region.

Major roads crossing are: Highway #20 (Centennial Parkway)
Fruitland Road
Fifty Road

Minor roads crossing are: Nash Road
Kenora Avenue
Lake Avenue
Grays Road
Greens Road
Millen Avenue
Dewitt Road
Jones Road
Glover Road
McNeilly Road
Lewis Road
Winona Road

SL-24

This screenline is located along the Beach Strip Canal which separates Hamilton from Burlington.

Major roads crossing are: QEW (Niagara)

Minor roads crossing are: Beach Blvd.

SL-25

This screenline is located along the western portion of the escarpment. It extends from east of Highway #403 to west of Sulphur Springs Road.

Major roads crossing are: Highway #403
Highway #2

Minor roads crossing are: Old Dundas Road
(County Road No. 32)
Sulphur Springs Road

SL-26

This screenline is located along the eastern approaches to Hamilton's CBD. It extends along the Red Hill Creek from the Harbour up to just north of Barton Street.

Major roads crossing are: Burlington Street

Minor roads crossing are: Brampton Street

CM:sw

APPENDIX D

DEMAND - CAPACITY FORECASTS BY SCREENLINE

TABLE D-1

FORECASTED (YEAR 2001) CORRIDOR TRAVEL

DEMANDS VERSUS EXISTING CAPACITIES*

Corridor (Screenline)	Existing Corridor Capacity**	Development Option						
		Trend	COLUC	South Central-ized	South Decen-tralized	Conglomerate	Eastern	Western
1	5.7	4.2	4.2	4.2	4.2	4.2	4.2	4.2
2	5.6	1.1	1.1	1.1	1.1	1.1	1.1	1.1
3	7.9	2.4	2.4	2.4	2.4	2.4	2.4	2.4
4	8.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3
5	3.6	1.1	1.1	1.1	1.1	1.1	1.1	1.1
6	3.7	1.8	1.8	1.8	1.8	1.9	1.8	2.3
7,9	6.6	6.9	6.9	6.8	6.8	7.7	6.8	16.5
8	10.7	20.1	20.3	19.9	19.9	20.9	20.2	28.0
10	3.3	2.1	2.1	2.1	2.2	2.1	2.1	2.1
11	9.9	4.0	5.6	5.9	5.4	4.2	3.9	3.8
12	5.6	2.5	2.5	2.5	2.5	3.8	2.9	2.4
13	4.5	4.4	2.5	2.2	4.0	2.3	2.0	1.9
14	2.8	4.7	5.1	5.3	4.8	5.4	5.4	3.7
15	13.6	19.1	19.5	18.9	19.0	18.5	15.7	15.4
16	7.6	15.1	14.3	13.8	15.3	16.5	16.1	12.9
17	2.0	0.4	0.3	0.3	0.3	0.4	0.5	0.2
18	13.1	23.6	23.4	22.4	22.8	23.8	22.9	29.5
19	16.2	15.0	15.4	15.3	14.9	14.7	14.3	15.3
20,26	12.0	17.5	17.4	17.3	17.1	17.9	19.5	16.4
21	8.3	5.4	5.4	5.4	5.4	5.4	5.3	6.2
22	15.2	11.5	11.7	11.8	11.7	11.5	11.0	10.9
23	3.6	7.4	6.9	6.8	6.8	7.3	10.5	5.9
24	5.8	12.1	11.8	11.9	12.0	12.0	12.2	12.6
25	5.2	4.7	3.9	3.3	4.0	3.9	3.5	3.4

* All data expressed in P.M. peak hour, peak direction person trips/1000.

** Assumes level of service E in all corridors except SL's 2 through 6 which assume level of service D.

Includes a widened York Street (6 lanes) and base year (1971) levels of transit ridership.

APPENDIX E

FUTURE TRANSIT RIDERSHIP ESTIMATES

ESTIMATION OF FUTURE TRANSIT RIDERSHIPS

A. Scope and Objectives

In order to adequately assess the transportation related impacts of alternative development concepts for the Official Plan, it was necessary to estimate the proportion of peak hour travel demands that could reasonably be expected to utilize public transit. These future estimated transit riderships were incorporated into the final demand-capacity analyses in order to determine the minimum additional road requirements that would be needed to serve the various development options to the year 2001.

Estimates of the nature of future transit patronage were also required to help quantify the extent to which each alternative development option met the goal of "locating new development so as to encourage greater and more efficient use of transit".

The level of planning for which the transit forecasts were required and the large number of alternatives under consideration necessitated that the estimating technique be straightforward (so that the underlying assumptions can be easily examined) yet sensitive to the differences in the development options under consideration. Thus, rather than assume a constant modal split for the whole study area or for each corridor, a procedure was developed for estimating future transit riderships based on the expected nature of development, future orientation of the transit system, and general policies relating to provision of additional transit service.

The estimating procedure (which is described in more detail in the next section) involved the following steps:

1. aggregate the year 2001, total person trip demand O-D tables to a zone system which approximates the planning divisions (32 x 32),

2. categorize each of the above zones into a small number (approx. 7) of homogeneous land use types according to the nature of development and thus general level of transit service to be received (for each development option),

3. define modal split relationships, which express the percentage of people which can reasonably be expected to utilize public transit as a function of: the type of development at each end of the trip, the relative travel time to make the trip by auto versus public transit, and assumptions pertaining to future orientation and role of transit within the Region,

4. determine representative values for the above modal split variables for each of the possible trip interchanges between the various land use types (as defined in step 2),

5. use the combined results of steps 3 and 4 to produce a modal split table by trip interchange (between the various land use types) which can then be systematically applied to the total person trip tables of the alternative development concepts to produce estimates of total transit ridership,

B. Detailed Assumptions

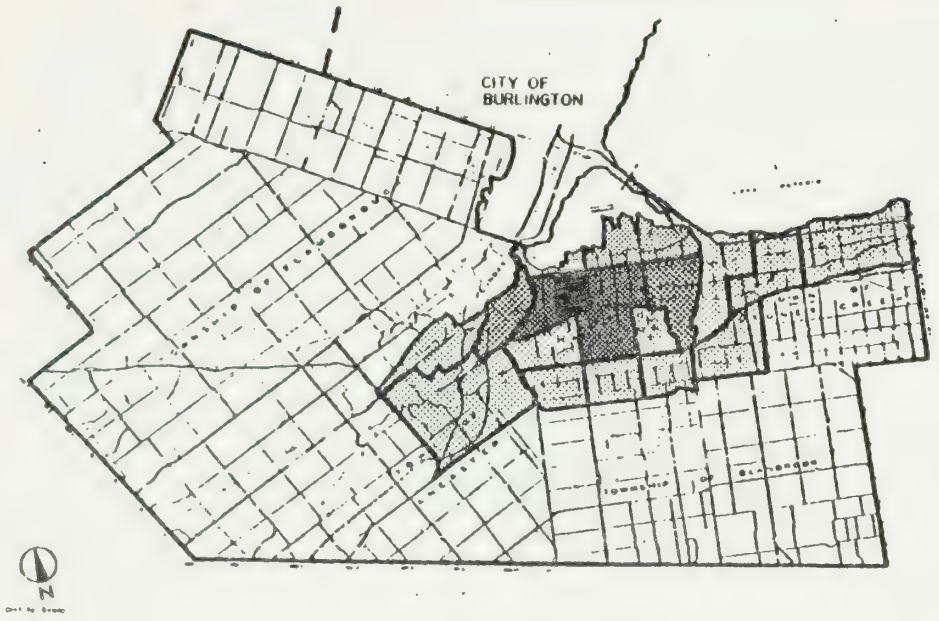
Transit Land Use Types - In order to minimize the number of different types of trip interchanges and provide a consistent basis for the application of modal split assumptions, the planning divisions were classified into a number of relatively homogeneous types or groups. Figure E-1 shows the areas falling into each group for each development option. The distinctive features of each group are given below:

CBD-is characterized by high residential/employment (service, retail) densities and is at the focal point of a primarily radially-oriented transit system.

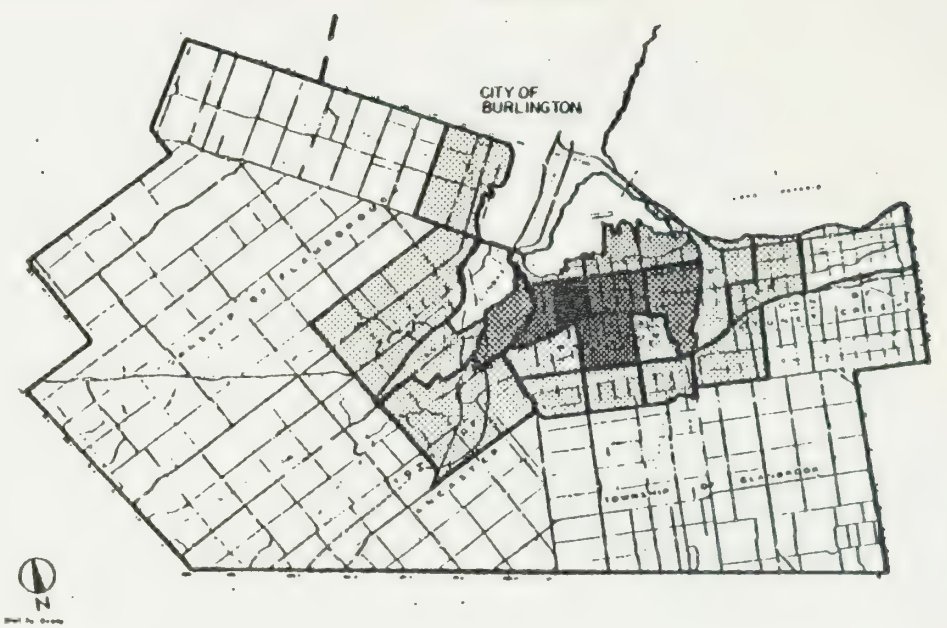
FIGURE E-1

TRANSIT LAND USE TYPES

A EASTERN



B WESTERN



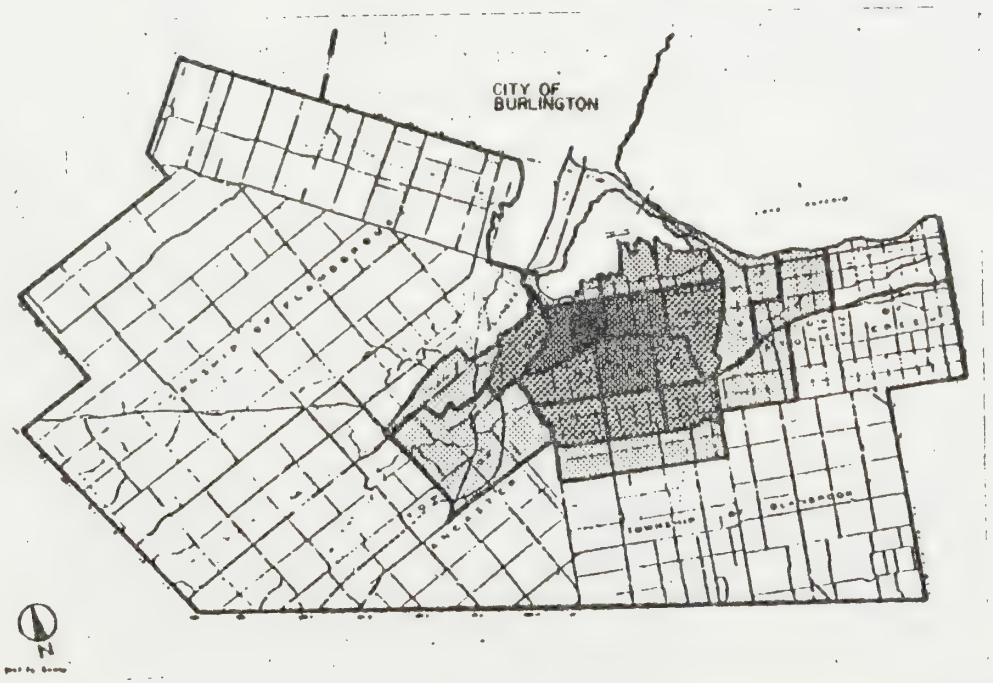
C TREND / CONGLOMERATE

C.B.D.
FRINGE C.B.D.
FRINGE SUB-REGIONAL CENTRE
BAYFRONT INDUSTRIAL
OTHER URBAN
RURAL

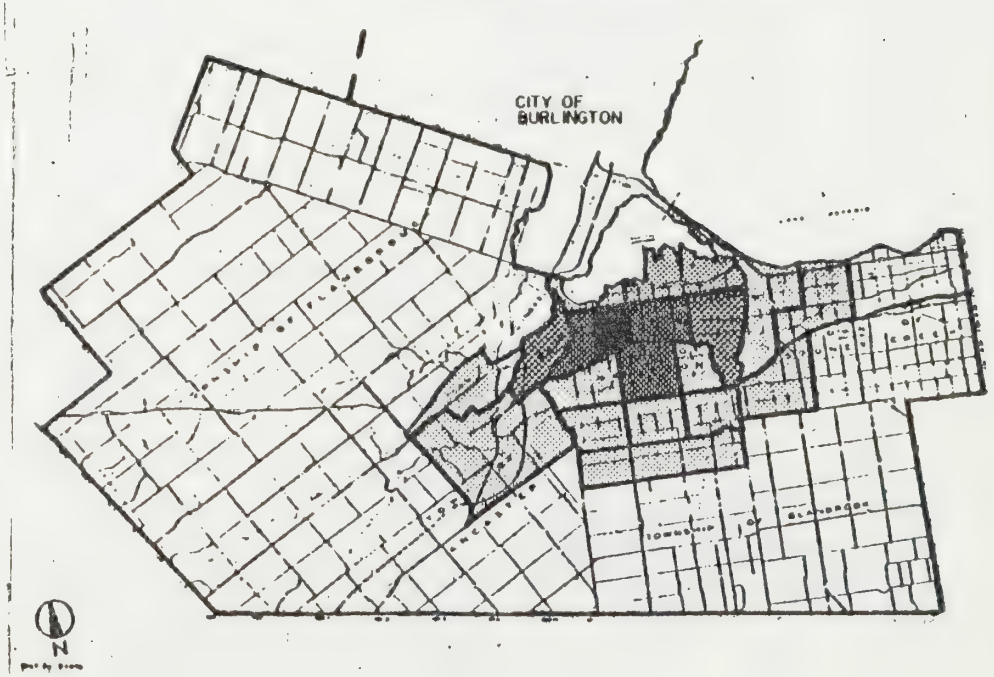
FIGURE E – 1....(Continued)

TRANSIT LAND USE TYPES

D SOUTH CENTRALIZED



E SOUTH DECENTRALIZED/C.O.L.U.C.



Fringe CBD-is characterized by medium to high residential/ employment densities and because it borders on the CBD takes advantage of overlapping routes on the centrally oriented transit spines.

Fringe Sub-Regional Centre-is similar to above but with slightly lower densities and located further from the CBD. Included in this classification are areas which will benefit (transit service-wise) from a secondary focusing of transit services towards a sub-regional centre.

Bay Front Industrial-is characterized by high basic employment densities, insignificant residential development and more difficult transit service characteristics, e.g., (provision of massive amounts of free employee parking).

Other Urban-is any other area (not covered by any of the above) located within the future urban area (medium to low densities).

Rural-is any area outside of the future urban boundary (low densities).

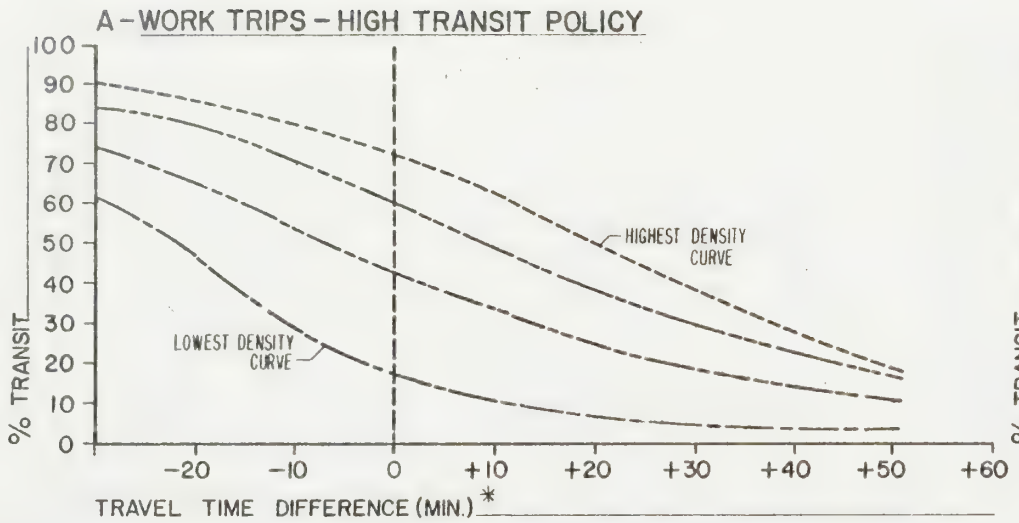
City of Burlington-is located outside of the Region of Hamilton-Wentworth and it was kept apart in order to be able to examine separately assumptions pertaining to inter-Regional transit service.

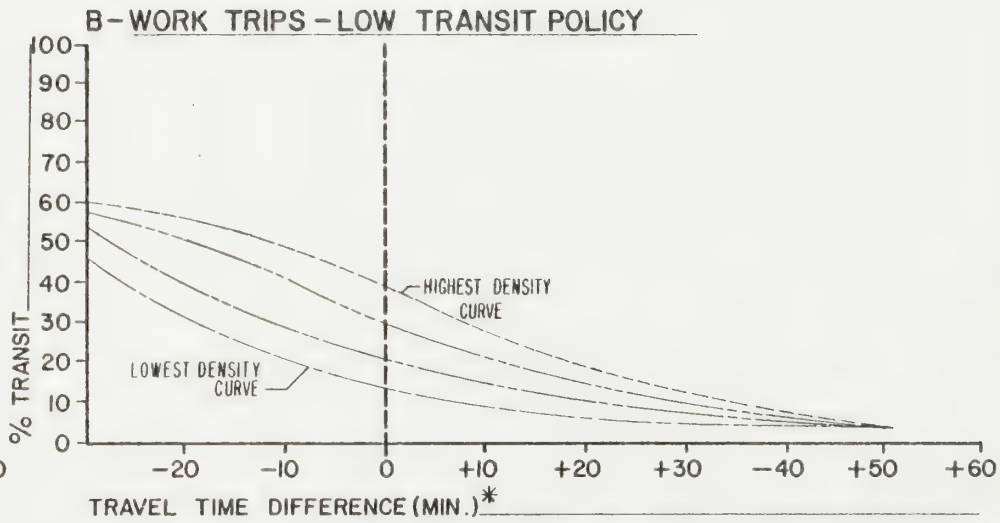
Transit Diversion Curves - Transit diversion curves, as shown on Figure E-2 (numerical data in Table E-1), were used as the basis for estimation of future transit riderships. These curves are identical to those used in the Rapid Transit Corridor Study and reflect high and low modal split behaviour for work trips (indicative of current Toronto versus Hamilton situations) as well as a set of curves for non-work related trips.

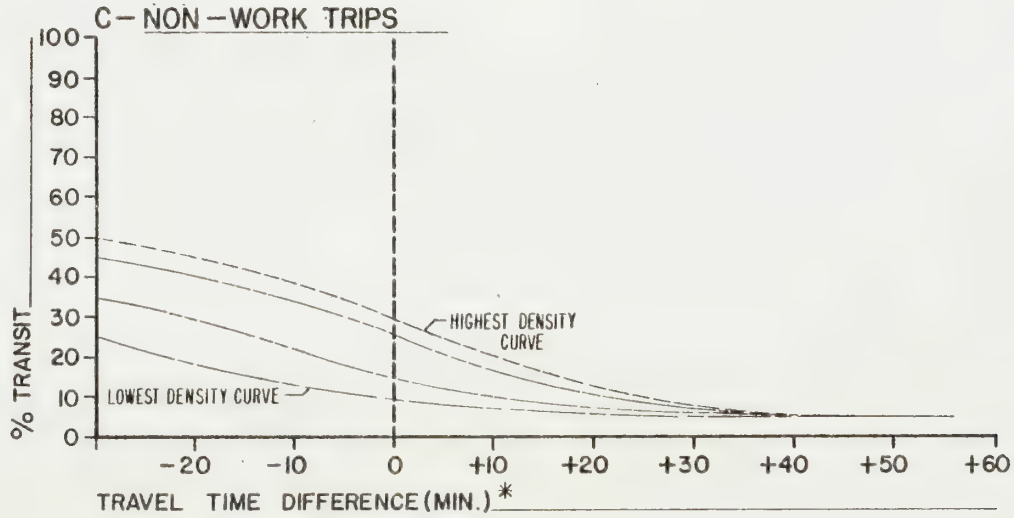
Level of Transit Service - The level of transit service to be received (between specific areas) was characterized by the relative travel times (transit minus auto) required to make the trip by auto versus public transit. Values for this variable were assigned on an interchange basis, i.e., (the potential for transit

FIGURE E-2

TRANSIT DIVERSION CURVES







NOTE: * TRAVEL TIME DIFFERENCE IS TRAVEL TIME BY TRANSIT MINUS TRAVEL TIME BY AUTO.

TABLE E-1

MODAL SPLITS

A. WORK TRIPS-HIGH TRANSIT POLICY

Travel Time Diff. (min.) \ Density	LOWEST → HIGHEST			
	1	2	3	4
-30	62	75	85	90
-10	29	55	70	80
+10	12	35	50	64
+30	6	18	28	40
+50	5	10	14	17

B. WORK TRIPS-LOW TRANSIT POLICY

Travel Time Diff. (min.) \ Density	LOWEST → HIGHEST			
	1	2	3	4
-30	45	53	57	60
-10	20	31	40	48
+10	8	14	20	25
+30	5	7	9	11
+50	5	5	5	5

C. NON-WORK TRIPS

Travel Time Diff. (min.) \ Density	LOWEST → HIGHEST			
	1	2	3	4
-30	25	35	45	50
-10	12	22	33	40
+10	8	10	14	18
+30	5	6	7	8
+50	5	5	5	5

at both ends of the trip were taken into account), with the CBD receiving the highest level of service and the Rural area the lowest. Travel time differences (for interchanges not involving exclusive right-of-way transit) were assigned on the following basis:

LEVEL OF TRANSIT SERVICE

Grade (as indicated in Table E-2)	Travel Time Diff. (transit minus auto in minutes)
Highest	5
↓	15
	25
Lowest	35

The level of transit service was increased for those interchanges in a corridor where exclusive R.O.W. transit was to be implemented by reducing the transit travel time by 5 to 10 minutes depending on the proximity of the trip ends to the corridor.

Density of Development - This variable was also assigned on an interchange basis, i.e., (according to density at both ends of a trip) such that four density levels were identified (see Table E-3) corresponding to the four transit diversion curves which are present for each type of trip.

Transit Policy - Table E-4 outlines the assumptions pertaining to the transit policy (high or low) which is desirable and/or achievable for work-related trips to the year 2001. Basically, it was felt that only those trips within the urban area and destined

Table E-2

LEVEL OF TRANSIT SERVICE

	C.B.D.	FRINGE C.B.D.	FRINGE S.R.C.*	BAY. IND.	OTHER URBAN	RURAL	BURLINGTON
C.B.D.							
FRINGE C.B.D.							
FRINGE SUB-REG. CENTRE							
BAYFRONT INDUSTRIAL							
OTHER URBAN							
RURAL							
CITY OF BURLINGTON							

Table E-3

DENSITY OF DEVELOPMENT

	C.B.D.	FRINGE C.B.D.	FRINGE SUB-REG. CENTRE	BAYFRONT	OTHER URBAN	RURAL	CITY OF BURLINGTON
C.B.D.							
FRINGE C.B.D.							
FRINGE SUB-REG. CENTRE							
BAYFRONT							
OTHER URBAN							
RURAL							
CITY OF BURLINGTON							

SCALE

HIGHEST

LOWEST

Table E-4

TRANSIT POLICY

	C.B.D.	FRINGE C.B.D.	FRINGE SUB-REG. CENTRE	BAYFRONT INDUSTRIAL	OTHER URBAN	RURAL	CITY OF BURLINGTON
C.B.D.							
FRINGE C.B.D.							
FRINGE SUB-REG. CENTRE							
BAYFRONT INDUSTRIAL							
OTHER URBAN							
RURAL							
CITY OF BURLINGTON							

* Sub-Regional Centre

directly to the CBD had the potential to achieve modal splits characteristic of the "high" work trip policy. All trips connected with the Rural area were assumed to adopt the "low" policy curves and other trips utilized median values between the two, i.e., (a weighted average of two-thirds of the high policy and one-third of the low).

Modal Split Tables - Table E-5 represents the final modal split tables (by trip interchange) which were applied to the future total person trip tables to obtain estimates of future transit riderships. These percentage transit values were obtained directly from the transit diversion curves using the assumptions as outlined in the preceding discussion.

Preliminary comparison of forecasted results with base year data (1972) indicated that the estimated proportion of intra-zonal transit trips (which should only be approx. 5-10% of total transit travel) was too high. This discrepancy resulted from aggregation problems which increased the number of intra-zonal person trips (which are most susceptible to the walk mode). As a result, the modal splits applied to intra-zonal travel were halved.

C. Future Transit Ridership Summaries

Tables E-6 through E-11 summarize the total person trip demands, estimated transit riderships, and net forecasted modal splits to the year 2001 for each of the alternative development options.

Table E-5

FUTURE P.M. PEAK HOUR MODAL SPLITS BY TRIP INTERCHANGE

A-PERCENTAGE OF WORK TRIPS

	C.B.D.	FRINGE C.B.D.	FRINGE S.R.C.*	BAY. IND.	OTHER URBAN	RURAL	BURLINGTON
C.B.D.	68		56		44	8	35
FRINGE C.B.D.	44		25				
FRINGE SUB-REGIONAL CENTRE	56	25		17		5	17
BAYFRONT INDUSTRIAL	25	17	25				
OTHER URBAN	44	17					
RURAL	8	5					5
CITY OF BURLINGTON	35	17				5	

B-PERCENTAGE OF NON-WORK TRIPS

	C.B.D.	FRINGE C.B.D.	FRINGE S.R.C.*	BAY. IND.	OTHER URBAN	RURAL	BURLINGTON
C.B.D.	23	12	19	8	15	12	7	12
FRINGE C.B.D.	19		8	7		5	
FRINGE SUB-REGIONAL CENTRE	15	8	7	8			
BAYFRONT INDUSTRIAL	12				7		7
OTHER URBAN	7		5				5
RURAL	12				7	5	
CITY OF BURLINGTON							

* Sub-Regional Centre

Overall summaries by trip purpose are presented in the first three tables (E-6 to E-8), while similar results for travel specifically oriented to the CBD can be found in Table E-9. Tables E-10 and E-11 show transit ridership estimates aggregated to a corridor or screenline basis, and finally, Table E-12 contains information on the estimated, future, average length of auto and transit travel.

TABLE E-6

P.M. PEAK HOUR PERSON TRIP DEMAND SUMMARIES (YEAR 2001)

LAND USE	INTERNAL PERSON TRIP DEMANDS/1000										
	HBW			HBO			TOTAL HB			NHB	TOTAL DEMAND
	H-W	H-B	TOTAL	H-W	H-B	TOTAL	H-W	H-B	TOTAL		
TREND	76.1	18.7	94.8	42.3	7.6	49.9	118.4	26.3	144.7	18.8	163.5
S. CENTRAL	77.3	18.4	95.7	41.2	7.7	48.9	118.5	26.1	144.6	18.8	163.4
S. DECENTRAL	76.5	18.5	95.0	42.1	7.6	49.7	118.6	26.1	144.7	18.8	163.5
C.O.L.U.C.	77.3	18.6	95.9	41.0	7.7	48.7	118.3	26.3	144.6	18.8	163.4
CONGLOMERATE	76.2	18.9	95.0	42.2	7.7	49.9	118.4	26.5	144.9	18.8	163.7
EASTERN	75.5	19.0	94.5	42.4	7.7	50.2	118.0	26.7	144.7	18.8	163.5
WESTERN	74.7	20.0	94.7	42.3	8.3	50.6	117.0	28.3	145.3	18.9	164.2

NOTE: H-W: includes only trips within the Hamilton-Wentworth Region

H-B: includes only trips between Hamilton-Wentworth and the City of Burlington

TABLE E-7

P.M. PEAK HOUR TRANSIT RIDERSHIP SUMMARIES (YEAR 2001)

LAND USE	*INTERNAL TRANSIT RIDERSHIPS/1000										
	HBW			HBO			TOTAL HB			NHB	TOTAL TRANSIT RIDERS
	H-W	H-B	TOTAL	H-W	H-B	TOTAL	H-W	H-B	TOTAL		
TREND	21.6	3.5	25.1	4.1	0.6	4.7	25.7	4.1	29.8	3.9	33.7
S. CENTRAL	23.1	3.5	26.6	3.7	0.6	4.3	26.8	4.1	30.9	4.0	34.9
S. DECENTRAL	22.1	3.6	25.7	3.5	0.6	4.1	25.6	4.2	29.8	3.9	33.7
C.O.L.U.C.	23.0	3.6	26.6	3.4	0.6	4.0	26.4	4.2	30.6	4.0	34.6
CONGLOMERATE	22.0	3.5	25.5	3.6	0.6	4.2	25.6	4.1	29.7	3.9	33.6
EASTERN	21.3	3.7	25.0	3.6	0.6	4.2	24.9	4.3	29.2	3.8	33.0
WESTERN	22.3	3.8	26.1	3.6	0.7	4.3	25.9	4.5	30.4	4.0	34.4

* Assumes existence of exclusive R.O.W. transit in corridors as shown on Alternative Transportation Systems maps.

NOTE: H-W: includes only trips within the Hamilton-Wentworth Region

H-B: includes only trips between Hamilton-Wentworth and the City of Burlington

TABLE E-8

P.M. PEAK HOUR MODAL SPLIT SUMMARIES (YEAR 2001)

LAND USE	*MODAL SPLITS (% DIVERTED TO TRANSIT)										
	HBW			HBO			TOTAL HB			NHB	TOTAL DEMAND
	H-W	H-B	TOTAL	H-W	H-B	TOTAL	H-W	H-B	TOTAL		
TREND	28	19	26	10	8	9	22	16	21	21	21
S. CENTRAL	30	19	28	9	8	9	23	16	21	21	21
S. DECENTRAL	29	19	27	8	8	8	22	16	21	21	21
C.O.L.U.C.	30	19	28	8	8	8	22	16	21	21	21
CONGLOMERATE	29	19	27	9	8	8	22	15	20	20	20
EASTERN	28	19	26	8	8	8	21	16	20	20	20
WESTERN	30	19	28	9	8	8	22	16	21	21	21

* M.S. expressed as a % of internal travel only.

NOTE: H-W: includes only trips within the Hamilton-Wentworth Region.

H-B: includes only trips between Hamilton-Wentworth and the City of Burlington

TABLE E-9

P.M. PEAK HOUR TRAVEL* OUT OF THE C.B.D.** (YEAR 2001)

LAND USE	PERSON TRIP DEMANDS/1000			TRANSIT RIDERSHIPS/1000			MODAL SPLITS (% TRANSIT)		
	HBW	HBO	TOTAL HB	HBW	HBO	TOTAL HB	HBW	HBO	AVERAGE HB
TREND	22.5	6.1	28.6	11.6	1.0	12.6	52	16	44
S. CENTRAL	20.6	5.5	26.1	11.3	1.0	12.3	55	18	47
S. DECENTRAL	21.4	5.8	27.2	11.1	1.0	12.1	52	17	44
C.O.L.U.C.	22.6	6.1	28.7	11.8	1.0	12.8	52	16	45
CONGLOMERATE	22.9	6.2	29.1	11.7	1.0	12.7	51	16	44
EASTERN	20.7	5.7	26.4	10.7	1.0	11.7	52	18	44
WESTERN	22.4	6.3	28.7	11.8	1.0	12.8	53	16	45

* All numerical values reflect internal travel only.

** The Central Business District (C.B.D.) is represented by Planning District 67 or Traffic Zones 87-90, 97 and 98.

TABLE E-10

P.M. PEAK HOUR CORRIDOR MODAL SPLITS* (YEAR 2001)

Screenline / Land Use	P.M. PEAK HOUR MODAL SPLITS (IN THE PEAK DIRECTION)									
	7,9	8	15	16	18	19	20	23	24	26
TREND	8	18	35	25	23	26	18	12	13	14
S. CENTRAL	8	18	37	28	23	26	20	12	13	14
S. DECENTRAL	8	18	35	29	23	26	20	12	13	14
C.O.L.U.C.	8	18	37	29	23	26	20	12	13	14
CONGLOMERATE	8	18	35	26	23	26	20	12	13	16
EASTERN	8	18	36	26	23	26	18	15	14	16
WESTERN	21	24	36	25	28	26	18	12	14	14
BASE YEAR (1971) MODAL SPLIT	-	-	21	8	11	14	14	-	-	7
YEAR 2001 M.S. (H.T.S.S.)	-	-	34	20	30	26	25	-	30	20

* Expressed as a % of internal travel.

TABLE E-11

YEAR 2001 TRANSIT RIDERSHIP

SCREEN-LINE / LAND USE	P.M. PEAK HOUR, PEAK DIRECTION TRANSIT RIDERS (1000)									
	7	8	15	16	18	19 (WB)	20	23	24	26
TREND	0.4	2.5	5.5	3.6	4.3	3.2	1.5	0.7	1.0	1.0
WESTERN	2.8	5.1	4.3	3.5	6.8	3.3	1.3	0.6	1.2	1.0
EASTERN	0.4	2.6	4.4	4.0	4.0	3.1	1.7	1.4	1.2	1.3
C.O.L.U.C.	0.4	2.6	5.9	4.0	4.1	3.3	1.6	0.7	1.0	1.0
S. CENTRAL	0.4	2.5	5.7	3.7	3.9	3.3	1.4	0.7	1.0	1.0
S. DECENTRAL	0.4	2.5	5.5	4.2	4.1	3.2	1.5	0.7	1.0	1.0
CONGLOMERATE	0.4	2.7	5.3	4.1	4.4	3.1	1.7	0.9	1.0	1.1

TABLE E-12

P.M. PEAK HOUR MEAN (AVERAGE) TRIP LENGTH SUMMARY* (YEAR 2001)

LAND USE	M.T.L. (IN MINUTES) OF TOTAL PERSON TRIP DEMAND			REPRESENTATIVE** M.T.L. OF TRANSIT TRIPS (IN MILES)	
	HBW	HBO	AVERAGE	H-W	ALL
TREND	15.4	12.7	14.4	4.24	5.44
S. CENTRAL	15.1	12.6	14.2	4.23	5.35
S. DECENTRAL	15.3	12.6	14.4	4.27	5.46
C.O.L.U.C.	15.2	12.7	14.3	4.15	5.32
CONGLOMERATE	15.5	12.7	14.5	4.19	5.35
EASTERN	15.3	12.7	14.4	4.25	5.52
WESTERN	15.5	12.9	14.5	4.60	5.81

* Based on internal travel only.

** Based on analysis of HBW transit trips.

NOTE: H-W: includes only trips with in the Hamilton-Wentworth Region

ALL: includes H-W (above) trips as well as trips between the Hamilton-Wentworth Region and the City of Burlington

APPENDIX F

TRANSIT EFFICIENCY MEASURES

TABLE F-1

TRANSIT EFFICIENCY

LAND USE OPTION	DEFICIT PER PASSENGER MILE	MEAN TRANSIT TRIP LENGTH (WITHIN H-W) (MILES)	DEFICIT PER PASSENGER
TREND	$0.0446	4.24	$0.189
S. CENTRAL	$0.0446	4.23	$0.189
S. DECENTRAL	$0.0446	4.27	$0.190
C.O.L.U.C.	$0.0446	4.15	$0.185
CONGLOMERATE	$0.0446	4.19	$0.187
EASTERN	$0.0446	4.25	$0.190
WESTERN	$0.0446	4.60	$0.205

VARIATION IN EFFICIENCY

10.8% - HIGH TO LOW